SOIL PILE CLOSURE PLAN
CONTACTS METALS WELDING, INC.
70 SOUTH GRAY STREET
INDIANAPOLIS, INDIANA
EPA ID NO. IND 089 263 412

SECOR Job No. R0054-001-01

Submitted by:
SECOR International Incorporated
8770 Guion Road, Suite L
Indianapolis, Indiana 46268

for:
CMW, Inc.
70 South Gray Street
Indianapolis, Indiana 46201

January 5, 1996

CLOSURE PLAN CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

IND 089 263 412
U.S. EPA I.D. Number

Contacts Metals Welding, Inc.
Facility Name

Howard D. Johnston
Signature of Owner/Operator

Howard D. Johnston, President
Name and Title

Jan. 5, 1996
Date

SECOR
International Incorporated

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Submitted by:
SECOR International Incorporated
8770 Guion Road, Suite L
Indianapolis, Indiana 46268

GREGORY B. BYER
REGISTERED
No.
890363
STATE OF
INDIANA
PROFESSIONAL ENGINEER

for:
CMW, Inc.
70 South Gray Street
Indianapolis, Indiana 46201

January 5, 1996

SECOR
International Incorporated

February 22, 1996

Mr. Victor Windle
Indiana Department of Environmental Management
Office of Solid and Hazardous Waste Management
Plan Review and Permit Section
Room Number 1154N
100 North Senate Avenue
Indianapolis, Indiana 46206-6015

RE: Modified Sampling and Analysis Plan
CMW, Incorporated
70 South Gray Street
Indianapolis, Indiana
U.S. EPA I.D. Number IND 089 263 412

Dear Mr. Windle:

On behalf of Contacts Metals Welding, Incorporated ("CMW"), SECOR International Incorporated ("SECOR") is providing the Indiana Department of Environmental Management ("IDEM") with this letter regarding CMW's proposed plans for completion of the Modified Sampling, Analysis and Cleanup Plan ("MSACP") at the CMW facility on 70 South Gray Street, Indianapolis, Indiana. The IDEM is currently reviewing the Closure Plan submitted on January 5, 1996 for closure of the soil piles created during the implementation of the original Sampling, Analysis and Cleanup Plan in 1989.

Because sampling and analysis activities proposed to be conducted during the implementation of the soil pile Closure Plan currently under review will provide significant information regarding the nature and extent of the contamination which pre-existed the soil piles, it would be most beneficial to the creation of the MSACP to wait until after the soil pile closure activities have been completed. Therefore, it is proposed that the MSACP be submitted to the IDEM sixty (60) days after the soil pile closure has been certified.

To reiterate past discussions, CMW proposes to include the following key features in the MSACP: 1) delineation of the lateral and vertical extent of contamination in the subsoils; 2) the evaluation of potential impact of contaminants on groundwater quality; 3) the evaluation of the fate and transport properties of the contaminants in the soil and groundwater; and 4) evaluation of remedial measures necessary to minimize risk to human health and the environment posed by the on-site contamination studied. Further, CMW intends to structure this plan after the Indiana Voluntary Remediation Program in determining risk-based cleanup levels and developing remedial alternatives.

We hope this letter serves to communicate the direction CMW proposes to take with regard to the MSACP which will address the pre-existing contamination at CMW. We would appreciate your written approval of our proposed plans. If you have any specific questions regarding the proposed content of the closure plan, please do not hesitate to contact me at (317) 876-8375. We look forward to your response.

Sincerely,

SECOR International Incorporated

Gregory B. Byer

Gregory B. Byer, P.E., C.P.G.
Principal Engineer

cc: Mr. Howard Johnston, CMW, Inc.
Mr. Lewis Beckwith, Baker & Daniels
Mr. Mike Cunningham, U.S. EPA Region V

FILE

Gary

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

NANCY A. MALOLEY, Commissioner

105 South Meridian Street
P.O. Box 6015
Indianapolis 46206-6015
Telephone 317-232-8603

RECEIVED
NOV 1 1988
OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V

VIA CERTIFIED MAIL - P 652 575 170

October 26, 1988

Mr. Nicholas Hale
CMW, Inc.
70 South Gray Street
Indianapolis, Indiana 46206

Re: Sampling, Analysis and Cleanup Plan
Notice of Deficiency
CMW, Inc.
Indianapolis, Indiana
IND 089263412

Dear Mr. Hale:

The Indiana Department of Environmental Management (IDEM) acknowledges receipt of your Sampling, Analysis and Cleanup Plan on August 26, 1988. Staff has reviewed the plan and found it to be inadequate.

The attached Notice of Deficiency (NOD) outlines the specific deficiencies in your cleanup plan and provides discussions relevant to revision. Three copies of the amended cleanup plan must be received by this office within forty-five (45) days of the receipt of this notice.

If you have any questions, please contact Mr. Floyd R. Hertweck at AC 317/232-3264.

Very truly yours,

Thomas Linson

Thomas E. Linson, Chief
Plan Review and Permit Section
Hazardous Waste Management Branch
Solid and Hazardous Waste Management

FRH/rmw

Enclosure

cc: Mr. Hak Cho, U.S. EPA, Region V (with enclosure)
Mr. Bernie Orenstein, U.S. EPA, Region V (with enclosure)
Mr. Matt Stokes, ATEC (with enclosure)
Mr. Noel Daniel, ATEC (with enclosure)
Mr. Robert Steele (with enclosure)
Mr. Lewis Schoenberger (with enclosure)
Marion County Health Department (with enclosure)

CMW INCORPORATED
Indianapolis, Indiana
IND 089263412
Deficiency Comments
Cleanup Plan Review
September 1988

I. Sample Locations and Analyses

A. The plan submitted discusses the cleanup of certain solvents and cadmium. Available information indicates that there were "P" and "F" listed wastes used and stored at the facility (waste containing cyanide), but these wastes are not listed in the cleanup plan nor are any of the soil samples analyzed for those types of waste. Since cyanide and other waste may be present at the facility, CMW Inc. (CMW) should include analyses for cyanide and the other hazardous constituents found at the site.

B. The analyses in Attachment A of the report submitted do not indicate the depths or clearly indicate the locations of the samples. Revise all analytical data submitted so that the location and depth of each sample is easily identified.

C. The plan discusses the use of an HNU-PID. The IDEM does not at this time accept HNU-PID readings as accurate indications of cleanup levels. The extent of contamination and cleanup should be verified by an appropriate method of analyses from SW 846 (i.e., Method 8240 as applicable, Method 7130 as applicable, etc.)

D. The cleanup plan (page 8) discusses confirmatory analyses for Trans-1, 2-dichlorethylene and trichlorethylene, but fails to include all the hazardous constituents which were indicated in the analytical results submitted. All additional analyses will be for those constituents which have been indicated as present by analyses in concentrations above detection limits, also included will be cadmium and other waste as discussed in this NOD (i.e., cyanide). The analyses submitted indicate the presence of the following constituents in BH-4 above detection limits.

Depth	Constituent Analyzed	Concentration ug/kg
6 inches	Trichloroethylene	96
	Tetrachloroethylene	39

12 inches	1,1-Dichloroethylene	180
	1,1-Dichloroethylene	260
	Trans-1,2-Dichloroethylene	4900
	Chloroform	630
	1,1,1-Trichloroethylene	5000
	Trichloroethylene	48000
	Tetrachloroethylene	2200
18 inches	Acetone	200
	1-1-Dichlorethylene	75
	1-1-Dichlorethylene	59
	Trans-1,2-Dichloroethylene	1300
	Chloroform	71
	1,1,1-Trichloroethylene	510
	Trichloroethylene	2400
	Tetrachlorethylene	250

E. Some of the values listed in Table 1 and Table 2 of Appendix B are not accurate (i.e., 1,1-dichloroethylene in sample BH-4). Revise all analytical data tables and the cleanup plan so that the units used are the same (i.e., ug/kg for organics and mg/l for metals).

F. Provide available boring information on the existing boreholes and any additional boreholes completed at the site. Include a discussion of the soil types, textures, etc.

G. The information submitted indicates the need for additional borings to define the depth of contamination. The analyses submitted for BH-4 indicates organics as deep as eighteen (18) inches. The depth of contamination by organics must be redefined by deeper sampling and analyses and additional borings. Cadmium is indicated in all boreholes sampled (at six (6) inches) and at depth in BH-2. The depth and areal extent of cadmium contamination must also be defined by additional borings.

H. The detection limit for cadmium in SW 846 (Method 7130) is 0.005 mg/l. The recommended cleanup level is the clean water standard of 0.010 mg/l or background, not 100.0 mg/l as stated in the plan.

III. Site Cleanup

A. For organics the plan states that at the point where the HNU-PID no longer detects VOC's, four soil borings to twenty four (24) inches will be made near the edge of the pit. A more acceptable method is needed to define the areal extent and depth of contamination of the spill area prior to excavation. This can be achieved by placing a sample grid (with two (2) foot grid intervals) over the spill area, taking a minimum of four (4) perimeter samples, with at a minimum, an additional four (4) samples within the grid. All boreholes are to be sampled, and analyzed at six (6) inches for the first two (2) feet and every foot thereafter until analyses of two (2) consecutive samples indicates no organics are found above detection limits (Method 8240). The areal extent will also be determined using detection limits (Method 8240). If the presence of organics is exhibited above detection limits at the perimeter, then the sampling grid will be enlarged until no evidence of contamination exists.

B. The plan states that cadmium is not indicated at high enough levels to be removed. The level used is 100 ppm (100 mg/l). This is not an acceptable level. Other more acceptable levels are background as discussed in "C" below or the clean water standard (0.010 mg/l). Boreholes 1, 2 and 3 indicate the presence of cadmium above acceptable limits. The depth and areal extent of cadmium contamination must be defined using the procedures as outlined in "A" above.

C. Background, if used, will consist of a minimum of four (4) boreholes selected by a random number generator (SW 846), sampled and analyzed at six (6) inches for the first two (2) feet, and every foot thereafter. Compositing is not accepted. A detailed justification, and supporting documentation for the locations chosen and the concentration level used must be submitted.

D. The plan discusses that the levels of cadmium, which the analyses indicate in concentrations of 0.4 mg/l to 10.4 mg/l are below EP Tox, but no justification or analyses supporting this are presented. Again, as discussed above, more acceptable methods of cleanup are background or clean water standards.

E. The facility proposes the use of TCLP (FR, June 13, 1986), however at the time of this review, TCLP is only a proposed cleanup standard. Additionally, CMW states that they are using TCLP but does not follow the procedures for the <u>proposed</u> rule. The plan uses the values resulting from Method <u>8240 and</u> compares them to TCLP values. When TCLP is promulgated, it will require analyses of samples following the methods for the TCL procedure which are proposed in 40 CFR 261.24. The proposed procedure does not allow for switching from other contaminant levels from other methods of analyses (i.e., Method 8240) to TCLP levels.

F. Cleanup should consist of the removal of <u>all</u> contaminated soils and debris from the site. The suggested <u>levels</u> for cleanup used are discussed above. Soil removed from the site shall be placed in containers compatible with the waste (not plastic sheets) prior to shipping off site.

IV. <u>Decontamination</u>

A. The plan must specify the means used to contain the rinsate generated as a result of decontamination.

B. For decontamination an initial wash with Tri-sodium Phosphate or other Laboratory grade detergent with three (3) rinses using distilled water is recommended.

C. The plan must provide a discussion of the decontamination of equipment used in the cleanup. It must also provide a detailed discussion of the procedures and methods used to contain the rinsate.

D. Provision must be made to provide analytical data resulting from analyses of the rinsate.

IV. <u>General</u>

A. A map indicating the proximity of surrounding businesses/residences, with north-south orientation, and a scale must be provided.

B. All maps (i.e., figures 2 and 3) must be revised to include a scale.

C. Revisions must be made so that the borehole numbers correlate readily with the analyses and text.

D. If the revised assessment, when completed, indicates the presence of contamination in the ground water, additional information or steps as stated below may be required.

1. A study of the site geology. This will include, but not be limited to, near surface soil types and site hydrogeology.

2. Ground water monitoring.

3. Remedial action.

TABLE OF CONTENTS

LIST OF ATTACHMENTS

SOIL PILE CLOSURE PLAN
CONTACTS METALS WELDING, INC.
70 SOUTH GRAY STREET
INDIANAPOLIS, INDIANA
EPA ID NO. IND 089 263 412

1. INTRODUCTION

The purpose of this document is to provide a written closure plan for two soil piles located at the Contacts Metals Welding, Inc. (CMW) facility in Indianapolis, Indiana. This plan is a required element of the executed Consent Agreement and Final Order (CAFO) between the U.S. Environmental Protection Agency, Region V (U.S. EPA) and CMW dated November 15, 1995 (Attachment A). Specifically, Item A of the Final Order requires CMW to submit to the Indiana Department of Environmental Management (IDEM) for review, approval, and/or modification a closure plan pursuant to 329 IAC 3.1-10-1 and 2 addressing closure of the soil piles (Closure Plan). The following Closure Plan has been prepared in accordance with the structure of the IDEM's March, 1994 "Hazardous Waste Management Unit Closure Guidance" ("Guidance Document"), and with specific reference to Stipulation 10 of the CAFO and relevant correspondences conducted in pursuit of negotiating the final CAFO.

2. FACILITY DESCRIPTION

CMW, Inc., is a component manufacturer of nonferrous parts used generally for electrical switching, high density applications, and resistance welding products. CMW's Standard Industrial Codes (SICs) are 3643 (current-carrying wiring devices), 3356 (nonferrous rolling and drawing, not elsewhere classified), and 3548 (welding apparatus). The types of products that CMW manufactures include electrical contacts, heat sinks, high density weights, high density materials, and resistance welding products.

CMW is located at 70 South Gray Street in Indianapolis, Indiana. The site is in a mixed industrial, commercial, and residential area on the east side of Indianapolis (see Figures 1 and 2, Attachment B). Directly to the south of the site is a rail yard owned by Consolidated Rail Corporation (Conrail). The CMW facility, which dates to the 1930's, has approximately 213,000 square feet of floor space. There are seven designated buildings over an area of approximately 6 acres of land.

Currently, CMW has a National Pollution Discharge Elimination System (NPDES) industrial discharge permit for process water and an air permit. CMW is also seeking a Part 70 or FESOP Air Permit.

3. DESCRIPTION OF WASTE MANAGEMENT UNIT TO BE CLOSED

The waste management unit that is the subject of this Closure Plan is a pair of soil piles located near the south boundary of the CMW facility. The locations and dimensions of the piles are shown in Figure 1 (Attachment B). There are approximately 400 cubic yards of soil in both piles combined.

The soil piles were generated in September 1989 when CMW, through its consultant ATEC Associates, Inc. (ATEC), conducted soil excavation in the rail siding area to the west of Building A, as shown in Figure 2 (Attachment B). The soil, which was discovered to contain chloroform, 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene (cis and trans), tetrachloroethene, 1,1,1-trichloroethane, and trichlorothene, was excavated as required by a Sampling, Analysis, and Cleanup Plan (SACP) approved by the IDEM. The plan indicated that approximately 16 cubic yards of contaminated soil would be excavated, loaded into roll-off containers, and transported to Adams Center Landfill in Fort Wayne, Indiana for final disposal. However, the actual volume excavated far exceeded the original estimate. The excavated soils were instead stockpiled on sheets of plastic liner laid upon the ground to the south and east of the excavation and covered. Although soils in the piles exhibit no hazardous waste characteristics, IDEM subsequently took the position that the soils in the piles contain listed hazardous waste, specifically F001. In 1995, CMW, U.S. EPA, and IDEM negotiated the CAFO (Attachment A), which incorporates provisions for using a risk assessment to demonstrate that the soils no longer contain hazardous waste and allowing for subsequent disposal of the soils as nonhazardous waste per Stipulation No. 10 of the CAFO.

Prior to placement of the soil piles, the area where the piles now reside was vacant and unused for years. The surface dimensions of the piles are 30 ft by 60 ft (western pile or Pile 1) and 162 ft by 12 ft (eastern pile or Pile 2). During the period between September 1989 and present, no soil was added to or removed from the piles. The piles have not been relocated or altered in any manner. Throughout this period the basal plastic liner has remained in place and a tarp-type cover has been maintained over the pile surface.

Since CMW began operations at the facility in 1978, there have been no other documented hazardous waste treatment, disposal, or storage activities at the site. However, older, undocumented releases evidently occurred prior to CMW's ownership of the property (those releases are hereafter referred to as "pre-existing contamination"). Pre-existing contamination is indicated by the extent and magnitude of the contamination revealed by the 1989 excavation activities and by a boring program conducted beneath the base of the excavation in 1990.

Because the area subject to closure was not an acknowledged treatment, storage or disposal (TSD) unit, there is no corresponding Part A Permit Application. In addition, CMW has never applied for a Part A Permit for any other units on the site. CMW is a small-quantity generator only.

As agreed to in the CAFO, CMW is applying only for closure of the soil piles with this document. No other unit has been identified for closure under RCRA. The modification and completion of the SACP to address pre-existing contamination will be a separate activity and is not part of this hazardous waste management unit closure.

It is required that the Closure Plan state verbatim the closure performance standard in 40 CFR 265.111. It is as follows:

> **§ 265.111 Closure performance standard.**
>
> The owner or operator must close the facility in a manner that:
> (a) Minimizes the need for further maintenance, and
> (b) Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post closure escape of hazardous waste, hazardous constitutes, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere, and
> (c) Complies with the closure requirements of this subpart, including, but not limited to, the requirements of §§ 265.197, 265.228, 265.258, 265.280, 265.310, 265.351, 265.381, 265.404, and 264.1102.
>
> [51 FR 16451, May. 2, 1986; as amended at 57 FR 37194, August 18, 1992]

In recognition of the potential presence of pre-existing contamination beneath the soil piles, CMW and IDEM have agreed upon specific clean closure criteria for the soil piles. CMW is concerned that the pre-existing contamination, which will be dealt with in a modified SACP, is recognized as a separate issue from any contamination that may have been contributed to the subsoils by the piles. This is a difficult issue to resolve since the types of contaminants are very similar. However, a "new" release from the piles would, given the absorptive and attenuative properties of the organic-rich, clayey subsoils, tend to decrease with depth, while an "old" release, i.e., one pre-dating the piles, would be deeper with a constant or increasing-with-depth character. In a letter dated July 7, 1995, from ATEC to IDEM, ATEC described the following cleanup criteria as agreed to during an earlier meeting between CMW and IDEM (see Attachment C for written correspondences):

> Clean closure without need for decontamination will be achieved:
>
> 1) at locations where contaminants are not present in any of the soil samples collected in the boring program described in Section 12 of the Closure Plan;
>
> 2) if contaminants present in the subsoils do not match the types of contaminants identified in the piles; or

3) where contaminants matching those in the piles are present, but increase or remain relatively constant to the full depth of the boring.

Conversely, decontamination will be indicated at those locations where contaminants matching those in the piles exist and the concentration of contaminants significantly decreases with depth to below practical quantitation limits by the termination of the boring.

CMW is interested in achieving clean closure of the piles and will clean close by removing the piles as well as any residual contamination identified by using the above-listed criteria. CMW does, however, reserve the right also to consider a risk assessment to set cleanup goals without full removal if the boring program should indicate that removal will be unfeasible and/or impractical as allowed in the Guidance Document.

4. MAPS AND DRAWINGS

A topographic map of the CMW site is provided in Attachment B, Figure 1. In addition, a map showing the CMW facility and immediate surroundings is provided in Figure 2, also in Attachment B. Shown on Figure 2 are the locations of two soil piles to be closed (Piles 1 and 2) and the excavation from which they were derived in 1989. The soil piles were placed on plastic (standard visqueen sheeting) and are covered by tarps.

Access to the area where the piles are located is restricted by fences along the property boundary. CMW has 24-hour, 7-day-per-week surveillance of the area where the soil piles are located.

5. CONTAINMENT DESCRIPTION

The soil piles were placed on sheets of visqueen plastic (estimated to be between 6 and 10 mils of polyethylene) during placement in 1989. The sheets of visqueen were laid directly on the ground surface and were overlapped. Limited photographic evidence indicates multiple sheets of visqueen were used.

The cover material consists of 4 mil reinforced woven polyethylene sheeting laid over the piles in an overlapping pattern. The covers extend beyond the foot of the piles acting to carry runoff away from the piles. The covers are anchored by heavy stones and wooden planks. The covers are inspected periodically and are re-anchored if loosened and replaced if torn. The plant engineer examines the covers on a monthly basis, although the piles are under constant surveillance by security personnel who have been instructed to notify the plant engineer if damage to the covers is observed.

The covers are not removed from the soil piles and new soil has not be added since the original creation of the piles in 1989. The soil observed to be present in the vicinity of the piles consists of 1 to 2 feet of fill containing varying amounts of coal cinders, stone, and black, oily or greasy material. The origin of the fill material is apparently related to a railroad siding which passed through the site. The black, oily/greasy fill was observed in 1989 to contain concentrations of volatile organic solvents, and it is apparent that this fill has the capacity to strongly retard the vertical movement of volatile organic compounds. Beneath the fill is brown, weathered glacial till with a soil type of clay loam or silty clay loam. The absorptive properties of the clay-rich soil combined with low percolation capacity would also inhibit vertical movement of volatile organic compounds.

6. HAZARDOUS WASTE LIST

The soil has been identified by the IDEM as F001. This interpretation is based on an inspection report which documented the presence of several drums labeled as F001, the dates for which had exceeded 90 days as labeled. Aside from the soil piles, CMW has never treated, stored, or disposed of hazardous waste at their facility. CMW is a small quantity generator.

U.S. EPA Hazardous Waste Number	Constituents	Process Waste
F001	1,1,1-trichloroethane, trichloroethene	still bottom waste

7. AIR EMISSIONS

It is not anticipated that significant air emissions will occur during the removal of the soil piles. The moist, clayey soil is not anticipated to yield significant dust or volatiles. As a precaution, the inhalation of vapors and dust by on-site construction workers was included in the site-specific risk assessment discussed in Section 11, and the worst-case risk associated with handling of the soils was found to be insignificant.

However, as a matter of good practice, only those soils being loaded at a given time will be uncovered, and uncovering will not be conducted far in advance of loading to maintain higher moisture content, which will in turn minimize dust and volatilization. As part of the site safety program, air monitoring for organic vapors will also be conducted.

8. PERSONNEL SAFETY AND FIRE PREVENTION

An appropriate site-specific safety and health plan (SSHP) will be developed that will establish and describe procedures and work practices which must be followed by all on-site personnel;

both contractors and visitors. The SSHP will be designed to comply with 29 CFR 1910.120, 29 CFR 1910.134, and 29 CFR 1926(c).

9. CLOSURE SCHEDULE

A schedule for completion of the closure activities for the piles is found in Attachment D. Per requirements (40 CFR 265.113[a]), the soil piles will be removed within 90 days of approval of the Closure Plan by IDEM. Per 40 CFR 265.113(b), CMW will have completed closure activities in accordance with the approved Closure Plan within 180 days after approval of the Closure Plan. The individual tasks and milestones associated with completing the closure activities are included in Attachment D. The key activities include waste characterization and disposal approval, removal and disposal of the soil piles, completion of soil sampling and analysis activities after pile removal, interpretation of the soil analytical data, removal of subsoils found to be contaminated by the piles, and closure certification. Critical points where IDEM input is required are also shown, most notably at the point of interpreting the soil analytical results. The independent engineer will be involved with the project at all phases.

It is not anticipated that a period longer than 180 days will be required to complete closure as shown in the schedule. However, if unforeseen circumstances arise which cause an unavoidable delay, forcing closure to go beyond 180 days, a detailed justification will be provided that meets the requirements of 40 CFR 265.113(c). Closure certification will be completed within 60 days after closure is complete.

It should be noted that certification of clean closure of the piles will be conducted upon removal of subsoils interpreted to be impacted by the piles using the criteria discussed in Section 3 above.

10. DECONTAMINATION OF TANKS, EQUIPMENT, AND STRUCTURES

The soil piles were placed only on fill materials as previously described. Decontamination after removal of the soil piles and liners will consist primarily of removing any spilled soils or other solid/liquid wastes which were in direct contact with the wastes. There are no containment structures as such to be decontaminated. Residual impacts to the subsoils are to be dealt with as described in Section 13 below.

11. CLEANUP LEVELS

It has been specified in Stipulation No. 10 of the CAFO that CMW may demonstrate to the IDEM that listed hazardous waste (F001) no longer exists in the piles and underlying subsoils by submitting a properly executed, site-specific risk assessment which shows to IDEM's satisfaction that the wastes and the material contaminated with wastes do not pose an unacceptable risk to human health or the environment. Further, in a letter dated September 19, 1995, from the U.S. EPA to the IDEM, it was stated that the U.S. EPA will provide technical assistance to the IDEM with regard to this risk assessment (Attachment C).

In the letter of September 19, 1995, the U.S. EPA agreed to conduct the review of the risk assessment to determine its adequacy. This risk assessment was completed for CMW by ATEC Associates, Inc. on March 19, 1994 (Attachment E). Per agreement with the U.S. EPA and the IDEM, the risk assessment was limited in scope (see correspondences dated September 19 and October 3, 1995 in Attachment C). The risk assessment was conducted only for the impacts posed by the piles without consideration of the pre-existing contamination (the modified SACP will address this issue). Specifically, a variety of potential human health impacts were considered based on the assumption that the soil piles remain on site and that no future remedial action would be taken. The receptors considered included future hypothetical on-site residents, trespassers, on-site workers, future temporary construction workers, and off-site residents. Pathways evaluated included soil ingestion, dermal contact with soil, and inhalation of soil vapors and particles.

Two populations of soil analytical results were used in the risk calculations. The first population included samples prior to (1988) or during (1989) excavation. The samples were tested for volatile organic compounds using U.S. EPA Method 8240. This testing indicated seven chemicals of concern: chloroform, 1,1-dichloroethane, 1,1-dichloroethene, total 1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene. The second population consisted of samples collected in September 1991 from the soil piles, again using U.S. EPA Method 8240. The analytical results for both populations, plus some information specific to sample locations and methodologies, are included in Attachment F.

Based on the results of the attached risk assessment, the greatest carcinogenic risk is to a hypothetical on-site resident child, although no carcinogenic risk was calculated to be greater than 10^{-6}. Non-carcinogenic risk was never calculated to be greater than 0.01, 1.0 being the lower limit for non-carcinogenic risk; therefore, non-carcinogenic risk was considered to be insignificant for this site.

For the hypothetical on-site resident child, the summation of carcinogenic risk for the four exposure pathways (ingestion, dermal contact, and particulate and vapor inhalation) in the reasonable maximum exposure (RME)[1] scenario is 3.3×10^{-8} ($10^{-7.48}$) for the samples collected in 1991 and 6.6×10^{-7} ($10^{-6.18}$) for the samples collected at or about the time of excavation in 1989. The 1991 results are believed to yield a more reliable indication of risk, as the 1989 data are skewed by a sample collected in 1988, prior to excavation, in a small "hot spot" (see BH-4B). The concentrations used in these calculations were statistically derived from the sampling data and are the arithmetic mean plus two standard deviations (95% confidence).

[1]The RME is a conservative estimate of above average chemical intake that is still within the range of possible exposure, essentially a worse case scenario.

The following table summarizes the RME values used (samples collected in 1989). Note that only the four compounds listed in Table 1 contribute to cancer risk and therefore are listed.

Table 1. Reasonable Maximum Concentrations for Carcinogens

Chemical of Concern	RME Concentration (95% confidence), mg/kg
Chloroform	0.79
1,1-Dichloroethene	0.18
Tetrachloroethene	2.00
Trichloroethene	26.00

Based on the results of the risk assessment, it has been demonstrated that the soils in the piles do not pose an unacceptable risk to human health. That is, there is a less than a 10^{-6} cancer risk for all receptors and scenarios considered. For this reason, using the criteria agreed to by U.S. EPA and IDEM, the soil in the piles no longer contains listed hazardous waste (F001). Thus, the soil piles will be disposed of as solid waste at a facility permitted to accept this type of non-hazardous solid waste.

As for the subsoils, based on the most conservative assumptions made in the risk assessment, concentrations measured during future confirmatory sampling lower than those in Table 1 would clearly yield an acceptable risk (less than 10^{-6}) to human health even for a hypothetical on-site resident child, and therefore it is implicit that these values represent very conservative clean-up levels. It is currently CMW's intent to excavate and dispose of all subsoils which meet the criteria for cleanup discussed in Section 3, rather than the values in Table 1. However, CMW reserves its right to use risk assessment to determine cleanup levels if the results of the boring program indicate that removal of the subsoils apparently impacted by the piles is unfeasible or impractical. CMW will use exactly the same methodologies as the ones used in the attached risk assessment to calculate the potential for human risk in the excavated subsoils once the sampling and analysis program has been completed. These results of the risk calculations will be used to determine whether or not the soil "contains" hazardous waste, which will determine to which disposal facility to transport the excavated subsoils.

12. SAMPLING AND ANALYSIS PLAN

Once the soil piles, liners, and covers have been removed from the site, a soil boring program will be conducted to determine the potential impact of the soil piles on the subsoils. As discussed above, the particular circumstances of this closure indicate that the soils were placed on pre-existing contamination which is chemically similar to the soil piles. There appear to be seven constituents of concern which are present in the soil piles and possibly in the soils beneath the piles.

Parameters to be Analyzed

The parameters to be analyzed will include seven specific volatile organic compounds (U.S. EPA Method 8240). The seven constituents of concern are discussed in the risk assessment (Attachment E). This list was agreed upon while negotiating the CAFO (see correspondence date September 19, 1995 in Attachment C). These seven compounds include: chloroform, 1,1-dichloroethane, 1,1-dichloroethene, total 1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene.

Investigative Boring Locations and Depths

As shown in Figure 2 (Attachment B), the soil piles occupy two separate areas. Pile 1 is approximately 30 ft by 60 ft and Pile 2 is approximately 162 ft by 12 ft. The height of Pile 1 at its crest is about 4.4 ft, while Pile 2 is about 3.6 ft.

Because the piles were placed on plastic on the ground surface, it is assumed there will be no locations requiring directed sampling (i.e., stained areas or cracks in concrete). In addition, since the cleanup criteria are based on the pattern of the vertical distribution of contaminants and the constituents, it is logical that the spacing of the borings should be in a regular sequence to best depict the true distribution of contamination; that is, a systematic subdivision of the basal areas with random boring selection within each subdivision. The area beneath each pile will be divided into sectors, and a randomly placed boring within each sector will be considered representative of that sector since there should not be any bias in selecting the boring locations. Soil removal will be uniform within each sector assuming the boring is representative. To determine the number of sectors for each pile, the method to determine the number of borings stated in the Guidance Document, Section 11 will be used. A regular 5 ft by 5 ft grid is superimposed on each pile. The numbers of sectors was determined by taking the cube root of the number of grid node intersections in each area. These calculations are shown below in Table 2.

Table 2. Determination of Number of Sampling Locations

	Pile 1	Pile 2
Length (ft)	60	165
Width (ft)	30	15
Number of Grid Intersections	13 x 7 = 91	34 x 4 = 136
Cube Root of Grid Intersections	$\sqrt[3]{91} \cong 4.497$	$\sqrt[3]{136} \cong 5.14$
Number of Sectors	4	5

Thus, a randomly placed boring will be located in each of the nine sectors shown in Figure 3 (Attachment B).

In addition to the borings beneath the piles, two additional borings will also be advanced in locations away from potential impact by the piles to establish the character of the pre-existing contamination (Figure 3, Attachment B).

The depths of all borings will be 5 ft. This sampling depth is considered more than adequate to characterize impact by the piles given (1) soils in the piles are clay-rich and the contaminant concentrations are generally low (i.e., the contaminants are relatively unleachable); (2) the piles are bounded by sheets of plastic; (3) the residence time is has only been about 6 years; (4) the subsoils have been observed to be organic-rich, attenuative soils; and 5) groundwater was not observed in the excavation which reached a depth of at least 5 ft. Soil samples will be taken continuously using the method described below from the ground surface to the bottom of the boring, and the entire sample will be described by a geologist using the USDA Soil Classification System. For chemical analysis, samples will be secured at intervals of every 6 in to a depth of 2 ft, and every foot from 2 to 5 ft for a total of 7 samples.

Boring and Sampling Methods

The soil borings will be advanced using a hydraulic push-type system (e.g., Geoprobe) acceptable to the IDEM. The sampling device will be a hollow stainless steel tube fitted with a new, 1-inch-diameter clear plastic inner sleeve. The stainless steel tube will be advanced by steady hydraulic pressure, and if necessary, a vibratory hammer. Once the sampling depth has been achieved, the inner sleeve will be extracted immediately by the on-site geologist. The geologist will then proceed to liberate the soil samples by depth interval, describe the sample, and place it into a glass sampling jar fitted with a tight-sealing teflon-lined lid. Each container will then be labeled and placed in an ice-packed cooler. Sampling quality control/quality assurance is discussed below.

Sampling Quality Assurance/Quality Control

As mentioned above, the soil samples will be immediately transferred to an appropriate sampling container once the sample has been extracted and described. The sample containers will consist of clear glass jars of at least 4 ounces in volume with tight-fitting, teflon-lined lids. The laboratory will supply the clean sampling containers. Labels will include the following information: (1) date of sampling; (2) sample number; (3) location of sample; (4) depth interval; (5) parameters to be analyzed; (6) name of sampler(s); and (7) amount and type of preservative (if relevant). Once filled, each sampling container will be placed in a Ziploc bag, situated in a sealable, insulated cooler and kept at 4 °C for transport. Once filled, the cooler(s) will be transported to the laboratory by a member of the sampling team, by a courier, or via common carrier.

Each cooler will contain a 250-ml (or larger) bottle filled with tap water to serve as a temperature blank. This blank will be used to determine the shipping and delivery temperature of the groundwater samples in each cooler. The temperature blank will be clearly labeled "TEMPERATURE BLANK" so as to distinguish it from any other bottles containing water samples. The temperature blank will be allowed to achieve temperature equilibrium inside each cooler prior to measurement. Before sealing and transporting the cooler to the laboratory, the temperature blank will be measured with a laboratory-certified thermometer. The temperature of each cooler will be recorded in a log book and the chain-of-custody form. Upon opening at the laboratory, the temperature of each cooler will be immediately determined by immersing a thermometer into the temperature blank. The date, time, shipping container temperature, and initials of the laboratory custodian who measures the delivery temperatures will be documented on the appropriate chain-of-custody form.

Each sample shipment will be accompanied by a chain-of-custody form which will also identify the requested analyses. All necessary paperwork will be placed in a waterproof envelope inside the lid of each cooler. Each cooler will be sealed with custody seals and covered by clean shipping tape.

For each batch of 20 (or fewer) samples, one field duplicate will be collected. In addition, a trip blank will also be collected for each day that samples are collected. In addition, for each batch of 20 (or fewer) samples, a sufficient sample amount will be collected for one matrix spike and one matrix duplicate. In addition, one equipment blank per day of sampling will be included.

Decontamination

New, laboratory-approved sampling containers, clean sampler liners, and new gloves will be used for each sampling interval. All reusable sampling equipment will be decontaminated before each use to avoid cross-contamination. The following decontamination procedures will be used for the stainless steel sampler and sample retainer and sample handling tools such as trowels, knives, or saws for cutting the inner sampling tube. These are the only items which will require decontamination.

1. After obtaining, extracting, and handling the soil sample, the equipment will be decontaminated by washing in a 5-gallon bucket containing non-phosphate detergent.

2. The second step will be a tap water rinse to remove gross contamination into a second 5-gallon bucket.

3. The equipment will then be triple-rinsed with deionized water (Type II reagent grade) or until all visible detergent has been removed. A pressure spray bottle will be used and the rinsate will be caught in a 5-gallon plastic bucket.

4. If visible organic residues remain or indications of high contaminant concentrations are observed, then organic solvents (i.e., acetone followed by pesticide quality hexane) shall be used in addition to the above rinses. Whenever organic solvents are used in the decontamination process, the equipment will be allowed to air-dry thoroughly before reuse.

The pressure spray bottle used to rinse non-dedicated sampling equipment will identify on the outside of the container that only Type II reagent deionized water will be added to the decontamination spray bottle. This will help to ensure that the container is filled with the proper decontamination agent.

Soil Sample Description Procedures

A copy of the form that will be used to record and document field soil descriptions and sampling information is found in Attachment G. This form will record the following information:

- facility name;
- project description;
- date and time;
- weather conditions;
- field personnel;
- soil sampling method and equipment;
- boring location and I. D. ;
- soil name[2];
- sample number(s);
- sample interval and depth(s);
- USDA soil textural classification[3];
- lithology;
- Munsell soil color[4];
- sedimentologic features;

[2]Soil mapping unit determined from the appropriate County Soil Survey, published by the United States Department of Agriculture, Soil Conservation Service.

[3]Soil Survey Staff, 1951 (reissued 1962). Soil Survey Manual, United States Department of Agriculture, Handbook No. 18, U.S. Government Printing Office, Washington, D.C., 503 p.

[4]Munsell Soil Color Charts. Munsell Color, Baltimore, MD., 1975.

- miscellaneous observations; and
- evidence of contamination (e.g., discoloration, odor, photoionization meter readings, etc.).

Soil horizons and/or soil types present at the site will be determined by a professional geologist in accordance with the U.S. Department of Agriculture Soil Classification and will be documented in the Closure Certification.

Quality Assurance Management Project (QAMP)

Laboratory analysis of the samples will be performed by Quanterra Environmental Services (Quanterra) of North Canton, Ohio. A copy of the analytical laboratory's Quality Assurance Management Plan (QAMP) is included as Attachment H. If a laboratory other than Quanterra is to be utilized, a modification to the closure plan will be submitted to the IDEM to obtain approval for use of the alternate laboratory prior to use of that laboratory. A new QAMP will be submitted to the IDEM for the new laboratory.

13. DESCRIPTION OF SOIL REMEDIATION ACTIVITIES

As mentioned above, CMW intends to clean close the soil piles. This will be accomplished by conducting removal and disposal of the soil piles and subsoils contaminated by the soil piles. The following describes the methods that will be used to accomplish clean closure.

Soil Pile Removal and Disposal

The risk assessment (Attachment E) has demonstrated that listed hazardous waste (F001) is no longer contained in the soil piles. As such, approval will be sought to dispose of the soil piles (approximately 400 cubic yards total) as special waste at the Waste Management Facility near Danville, Indiana. Application will be made for special waste disposal approval with the IDEM Office of Solid and Hazardous Waste, Special Waste Section, and prerequisite soil testing for disposal compatibility will be conducted as the disposal facility requires. A site-specific health and safety plan will also be prepared.

The contractor will be required to set up an equipment decontamination area prior to beginning loading. It is anticipated that a front loader will be used to load the soils into dump trucks or roll-off containers. The transport vehicles will be covered with a tarp, once loaded, to prevent the escape of dust, vapors, or soil fragments. The covers and base liners will also be transported with the soils. In addition, efforts will be made to load incidental spillage which occurs during loading. Before leaving the site, all gross contamination will be removed from the equipment using a high pressure hot water washer.

Subsoil Contamination Delineation and Removal

Once the soil piles have been removed from the site, the soil boring program described above in the Sampling and Analysis Plan will be completed. After the analytical results of the sampling and analysis are received, a determination will be made as to where subsoils were impacted by the soil piles. The basal area for each pile will be divided into 4 sectors, and a randomly chosen boring will define whether or not the soil pile has impacted that sector. If impact is determined to exist, the vertical extent of the contamination will be determined by the random boring. The limits of removal for each sector, if required, will be defined by the lateral boundaries of the sector and the depth to the last sample impacted by the piles. As discussed above in Section 3, only those soil borings which have a decreasing-with-depth concentration profile *and* contain constituents which match those in the piles will be considered to be impacted by the piles. Relatively constant or increasing-with-depth concentration profiles or those locations where the chemicals in the subsoils do not match to soil piles will not be considered to be impacted and therefore will not require removal. In sectors determined to be impacted, the contractor will be directed to remove impacted volume of subsoil down to the depth where pile-related contamination is interpreted to have ended based either on practical quantitation limits or based on cleanup levels determined by a supplemental risk assessment.

It is being assumed that the subsoils will not be found to contain listed hazardous waste using the risk assessment methodologies discussed above since concentrations are not anticipated to be any higher than the soil piles themselves (this same assertion is not necessarily made regarding the pre-existing contamination which is not the subject of this closure plan). Thus, it is apparent that the subsoils will be transported to the same disposal facility as the piles and additional disposal approvals will not be required. In general, the same methods will be used to load and transport the subsoils as the soil piles. If subsoils are removed, clean fill soil will backfilled in the excavation.

14. DISPOSAL UNIT CLOSURES

CMW intends to clean close the soil piles. There are no other units which will be closed in place such as landfills, tanks, other waste piles, or surface impoundments. Post closure care will not be required for this closure. The final status of the pre-existing contamination has not been determined at this time, but will be addressed in the modified SACP.

15. DESCRIPTION OF EQUIPMENT CLEANING

The methods for decontaminating sampling equipment and heavy equipment were described in Sections 12 and 13, respectively. The decontamination residues will be tested prior to disposal to determine concentrations of constituents. The rinsate will be drummed and labeled as accumulated.

16. CLOSURE AND POST-CLOSURE COST ESTIMATES/FINANCIAL ASSURANCE

The following table summarizes the estimated costs for implementation of this closure plan given the assumption that all soils will be classified as non-hazardous waste, 400 cubic yards of soil exists in both piles, and 200 cubic yards of pile-impacted soil will be removed and classified as non-hazardous waste.

Table 3. Estimated Costs for Closure

Item	Estimated Cost
Consulting Fees	$7,000.00
Disposal of Soil Piles	$25,000.00
Sampling and Analysis Program	$22,500.00
Excavation and Disposal of Impacted Subsoils	$12,500.00
Closure Certification	$4,000.00
Contingency (15%)	$10,650.00
Total Estimated Cost	**$81,650.00**

CMW believes that financial assurance for closure should not be required, as no provision was made for it in the CAFO. However, upon notification from IDEM that financial assurance for closure will be required, CMW will make arrangements to provide financial assurance within 30 days after final approval of its closure plan and before removal activities begin.

ATTACHMENT A

CONSENT AGREEMENT AND FINAL ORDER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

DEC 12 1995

REPLY TO THE ATTENTION OF:

DRE-8J

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Howard D. Johnston, President
Contacts Metals Welding, Inc.
70 South Gray Street
Indianapolis, Indiana 46206

Re: Consent Agreement and Final Order
Contacts Metals Welding, Incorporated
Docket No. V-W-15-93

Dear Mr. Johnston:

Enclosed please find a copy of the fully executed Consent Agreement and Final Order entered into by Contacts Metals Welding, Incorporated and the United States Environmental Protection Agency. Should you have any questions feel free to contact Michael Cunningham of my staff at (312) 886-4464. Thank you for your cooperation in resolving this matter.

Sincerely yours,

Joseph M. Boyle

Joseph M. Boyle, Chief
Enforcement and Compliance Assurance Branch

Enclosure

cc: Lewis D. Beckwith, Baker and Daniels /w enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

RECEIVED
REGIONAL HEARING

IN THE MATTER OF:

CONTACTS METALS WELDING, INCORPORATED
70 SOUTH GRAY STREET
INDIANAPOLIS, INDIANA 46206

EPA ID No.: IND 089 263 412

DOCKET NO. V-W-15-93

CONSENT AGREEMENT
AND FINAL ORDER

'95 ... P 2:56

I. PREAMBLE

On June 30, 1993, a Complaint was filed in this matter pursuant to Section 3008(a) of the Resource Conservation and Recovery Act, as amended (RCRA), 42 U.S.C. Section 6928(a), and the United States Environmental Protection Agency's Consolidated Rules of Practice Governing the Administrative Assessment of Civil Penalties and the Revocation or Suspension of Permits, 40 CFR Part 22. The Complainant is the Associate Division Director, Office of RCRA, Waste Management Division, Region V, United States Environmental Protection Agency (U.S. EPA). The Respondent is Contacts Metals Welding, Incorporated, located at 70 South Gray Street, Indianapolis, Indiana.

II. STIPULATIONS

The parties, desiring to settle this action, enter into the following stipulations:

1. Respondent has been served with a copy of the Complaint, Findings of Violation and Compliance Order (Docket No. V-W-15-93) in this matter. The Complaint is incorporated herein by reference.

2. Respondent is an Indiana corporation whose registered

agent in Indiana is Mr. Donald T. Clayton. Respondent owns and/or operates a facility whose business is located at 70 South Gray Street, Indianapolis, Indiana (the "Facility").

3. Respondent admits that Complainant has jurisdiction to issue the Complaint in this matter and jurisdiction to enter into this Consent Agreement and Final Order (CAFO). Respondent agrees not to contest such jurisdiction in any proceeding to enforce the provisions of this CAFO.

4. Respondent neither admits nor denies the specific factual allegations contained in the Complaint other than admissions made in Respondent's Answer.

5. Respondent explicitly withdraws its request for a hearing and waives any and all rights under any provisions of law to a hearing on the allegations contained in the Complaint or to challenge the terms and conditions of this CAFO.

6. If the Respondent fails to comply with any provision contained in this CAFO, Respondent waives any rights it may possess in law or equity to challenge the authority of the U.S. EPA to bring a civil action in the appropriate United States District Court to compel compliance with the CAFO and/or to seek an additional penalty for the noncompliance.

7. Respondent consents to the issuance of the Final Order hereinafter set forth and hereby consents to the payment of a civil penalty of ONE HUNDRED TWENTY SEVEN THOUSAND EIGHT HUNDRED SEVENTY SIX DOLLARS ($127,876). Respondent agrees not to claim or attempt to claim a Federal income tax deduction or credit

covering all or any part of the cash civil penalty paid to the U.S. Treasury.

8. Respondent shall give notice and a copy of this CAFO to any successor in interest prior to any transfer of ownership or operational control of the Facility. This CAFO is binding on Respondent and any successors in interest.

9. On January 31, 1986, the State of Indiana was granted final authorization by the Administrator of the U.S. EPA, pursuant to Section 3006(b) of RCRA, 42 U.S.C. Section 6926(b), to administer a hazardous waste program in lieu of the Federal program. Section 3008 of RCRA, 42 U.S.C. Section 6928, provides that the U.S. EPA may enforce State regulations in those States authorized to administer a hazardous waste program.

10. IDEM, as the Agency authorized to implement Indiana closure regulations in lieu of U.S. EPA, will make the ultimate decision on the adequacy of closure of the waste piles referred to Paragraph 18 of the Complaint ("CMW waste piles"). U.S. EPA hereby states that the application to the CMW waste piles of the principles set forth in the August 22, 1991 letter from IDEM to CMW is allowable and appropriate. Such application would permit soil from the CMW waste piles and subsoil contaminated by the piles to be managed as non-hazardous waste if Respondent demonstrates to IDEM's satisfaction that the listed hazardous waste (F001) no longer remains in the soil. Respondent may make this demonstration by submitting a properly executed, site-specific risk assessment which shows to IDEM's satisfaction that

the wastes and material contaminated with wastes do not pose an unacceptable risk to human health or the environment.

11. Nothing in this CAFO shall be construed to relieve Respondent from its obligation to comply with all applicable Federal, State and local statutes and regulations, including the RCRA Subtitle C requirements at 40 CFR Parts 260 through 270.

12. This CAFO shall become effective on the date it is signed by the Regional Administrator.

III. FINAL ORDER

Based on the foregoing stipulations, the Parties agree to the entry of the following Final Order:

A. Respondent shall, within thirty (30) days of the effective date of this Order, submit to the Indiana Department of Environmental Management (IDEM) for review, approval, and/or modification a closure plan pursuant to 329 IAC 3.1-10-1&2 (40 CFR Part 265 Subpart G) addressing closure of the waste piles referred to in Paragraph 18 of the Complaint (the "Closure Plan").

B. Upon approval and/or modification by IDEM of the Closure Plan, including the period of any appeal or review proceeding initiated by Respondent with respect to any disapproval or modification made by IDEM with respect to the Closure Plan, Respondent shall carry out and complete all closure activities in accordance with the Closure Plan and the schedules therein.

C. Respondent shall, within sixty (60) days of completion of closure, submit to IDEM for review and approval a certification of closure pursuant to 329 IAC 3.1-10 1&2 (40 CFR §265.115).

D. Respondent shall notify U.S. EPA in writing upon achieving compliance with Paragraphs A through C of this Final Order within fifteen (15) calendar days of the date compliance is achieved. If any required action has not been taken or completed in accordance with any requirement of this Final Order, Respondent shall notify U.S. EPA of the failure, its reasons for the failure, and the proposed date for compliance within ten (10) calendar days of the due date set forth in the Final Order.

E. All reports, submissions, and notifications required by this Final Order shall be submitted to the United States Environmental Protection Agency, Region V, Waste Management Division, RCRA Enforcement Branch, Attention: Michael Cunningham (HRE-8J), 77 West Jackson Boulevard, Chicago, Illinois 60604, unless otherwise specified.

F. A copy of these documents and all correspondence with U.S. EPA regarding this Final Order shall also be submitted to Mr. Thomas Linson, Indiana Department of Environmental Management, 100 North Senate Avenue, Indianapolis, Indiana 46206.

G. Respondent shall pay a civil penalty in the amount of ONE HUNDRED TWENTY SEVEN THOUSAND EIGHT HUNDRED SEVENTY SIX DOLLARS ($127,876) within thirty (30) days of the effective date this Final Order. Payment shall be made by certified or cashier's check payable to the Treasurer of the United States of

America and shall be mailed to U.S. EPA, Region V, Regional Finance Office, P.O. Box 70753, Chicago, Illinois 60673. The name of the Respondent and the Docket Number of this proceeding shall be clearly marked on the face of the check. Copies of the transmittal of the payment shall be sent to: the Regional Hearing Clerk, Planning and Management Division (M-19J); the Solid Waste and Emergency Response Branch Secretary, Office of Regional Counsel (CS-29A); and Mr. Michael Cunningham of the RCRA Enforcement Branch (HRE-8J); U.S. EPA, 77 West Jackson Boulevard, Chicago, Illinois 60604-3590.

IV. AMOUNTS OVERDUE

Pursuant to 31 U.S.C. Section 3717, Respondent shall pay the following amounts on any amount overdue under this Consent Agreement and Final Order (CAFO):

A. **Interest.** Any unpaid portion of the assessed penalty shall bear interest at the rate established by the Secretary of the Treasury pursuant to 31 U.S.C. Section 3717(a)(1). Interest shall begin to accrue from the date a copy of this CAFO is mailed to Respondent, provided, however, that no interest shall be payable on any portion of the assessed penalty that is paid within thirty (30) days of the mailing date.

B. **Monthly Handling Charge.** Respondent shall pay a late payment handling charge of $20.00 on any late payment, with an additional charge of $10.00 for each subsequent 30-day period over which an unpaid balance remains.

C. **Non-Payment Penalty.** On any portion of the assessed penalty more than ninety (90) days past due, Respondent shall pay a non-payment penalty of six percent (6%) per annum, which shall be calculated as of the day the underlying penalty first became past due. This non-payment penalty is in addition to charges which accrue or may accrue under sections (A) and (B).

V. PENALTIES FOR NONCOMPLIANCE

Failure to comply with any requirement of this Final Order may subject Respondent to liability for a penalty of up to TWENTY-FIVE THOUSAND DOLLARS ($25,000) for each day of continued non-compliance with the terms of the Final Order. U.S. EPA is authorized to assess such penalties pursuant to RCRA Section 3008(c).

VI. EFFECT OF SETTLEMENT

A. This Consent Agreement and Final Order (CAFO) constitutes the entire settlement between the parties, and constitutes final disposition of the Complaint filed in this case and stipulations hereinbefore recited. All prior discussions, negotiations, and document drafts are merged herein.

B. Each party shall bear its own costs and attorneys' fees in the action resolved by this CAFO.

C. Respondent's obligations under this CAFO shall end when it has satisfied all of the requirements of Section III of this CAFO (including full payment of the civil penalty) and, if applicable, full payment of any amounts overdue pursuant to Section IV.

D. Respondent waives any right it may have pursuant to 40 CFR 22.08 to be present during discussions with, or to be served with and reply to, any memorandum or communication addressed to the Director, Waste Management Division, or his superiors, where the purpose of such discussion, memorandum or communication is to persuade such an official to accept and issue the Consent Agreement and Final Order.

VII. RESERVATION OF RIGHTS

Notwithstanding any other provision of this Final Order, U.S. EPA expressly reserves any and all rights to bring an enforcement action pursuant to Section 7003 of RCRA, 42 U.S.C. Section 6973, or other statutory authority should U.S. EPA find that the handling, storage, treatment, transportation, or disposal of solid waste or hazardous waste at the Facility may present an imminent and substantial endangerment to health or the environment. U.S. EPA also expressly reserves the right: (1) for any matters other than violations alleged in the Complaint, to take any action authorized under Section 3008 of RCRA; (2) to enforce compliance with the applicable provision of Indiana Administrative Code, Title 329 Article 1-2; (3) to take any action under 40 CFR Parts 124 and 270; and (4) to enforce compliance with this Consent Agreement and Final Order.

VIII. SIGNATORIES

Each undersigned representative of a Party to this Consent Agreement and Final Order consisting of nine (9) pages certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Agreement and Final Order and to legally bind such party to this document.

Agreed to this 12th day of OCTOBER, 1995.

By Howard D. Johnston
~~Mr. Daniel A. Orr~~ HOWARD D. JOHNSTON
For Contacts Metals Welding, Incorporated
Respondent

Title President

Agreed this 7th day of December, 1995.

By Norman Niedergang
Norman R. Niedergang, Director
Waste, Pesticides and Toxics Division
U.S. Environmental Protection Agency
Region V, Complainant

The above agreed and consented to, it is so ordered this 8th day of December, 1995.

Valdas V. Adamkus
Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency
Region V

CERTIFICATE OF SERVICE

I hereby certify that I have caused a copy of the foregoing CAFO to be served upon the person designated below on the date below, by causing said copy to be deposited in the U.S. Mail, First Class and certified-return receipt requested, postage prepaid, at Chicago, Illinois in an envelope addressed to:

Lewis D. Beckwith
Baker and Daniels
300 North Meridian Street
Indianapolis, Indiana 46204

Howard D. Johnston
Contacts Metals Welding, Inc.
70 South Gray Street
Indianapolis, Indiana 46206

I have further caused the original of the CAFO and this Certificate of Service to be served in the Office of the Regional Hearing Clerk, located in the Planning and Management Division, U.S. EPA, Region 5, 77 West Jackson Boulevard, Chicago, Illinois 60604, on the date below.

These are said persons' last known addresses to the subscriber.

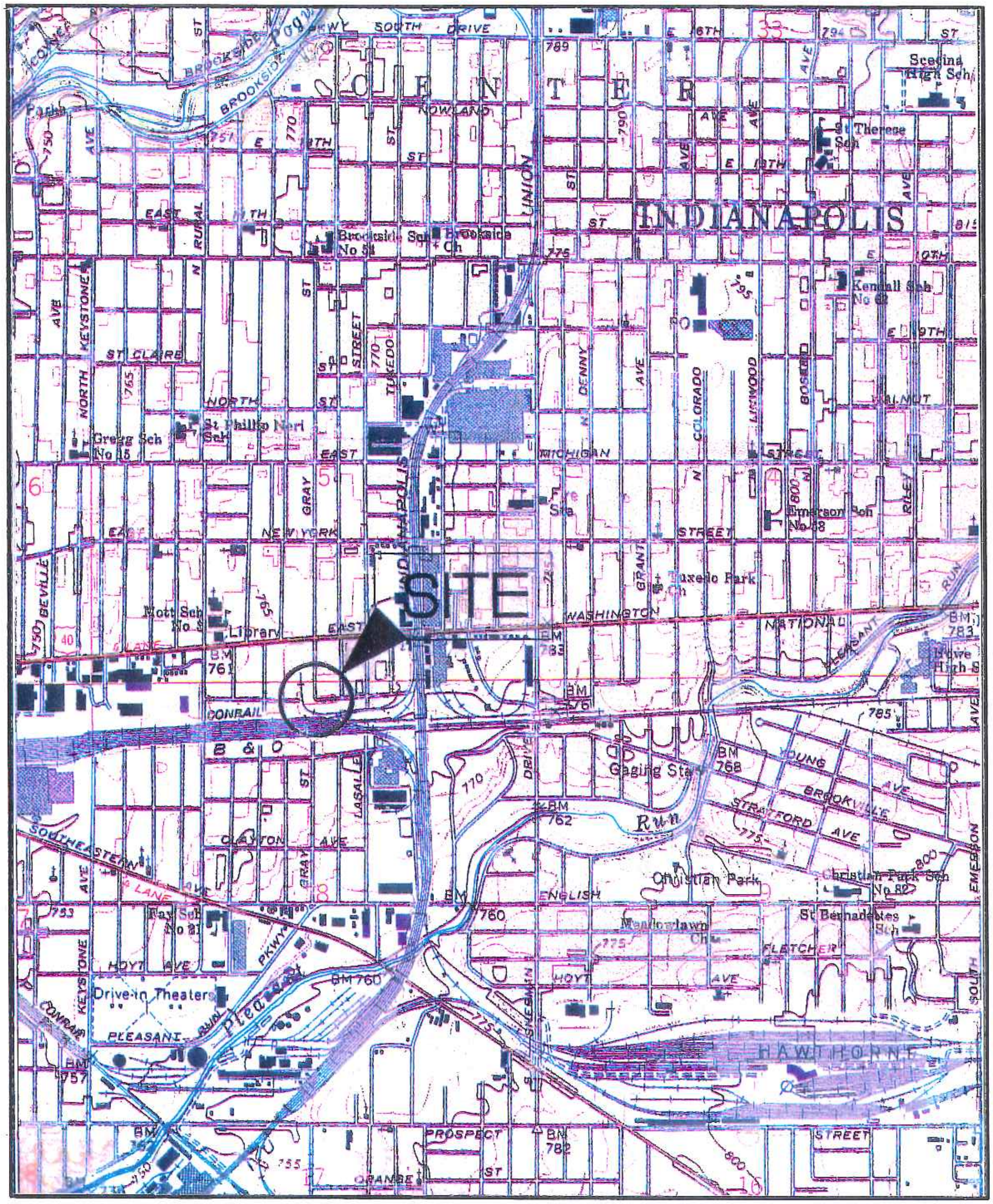
Dated this 13th day of December 1995.

Anita Perry
Secretary, Enforcement and Compliance
Assurance Branch
U.S. EPA, Region 5

REGION V
'95 DEC 12 P2:56

ATTACHMENT B

FIGURES



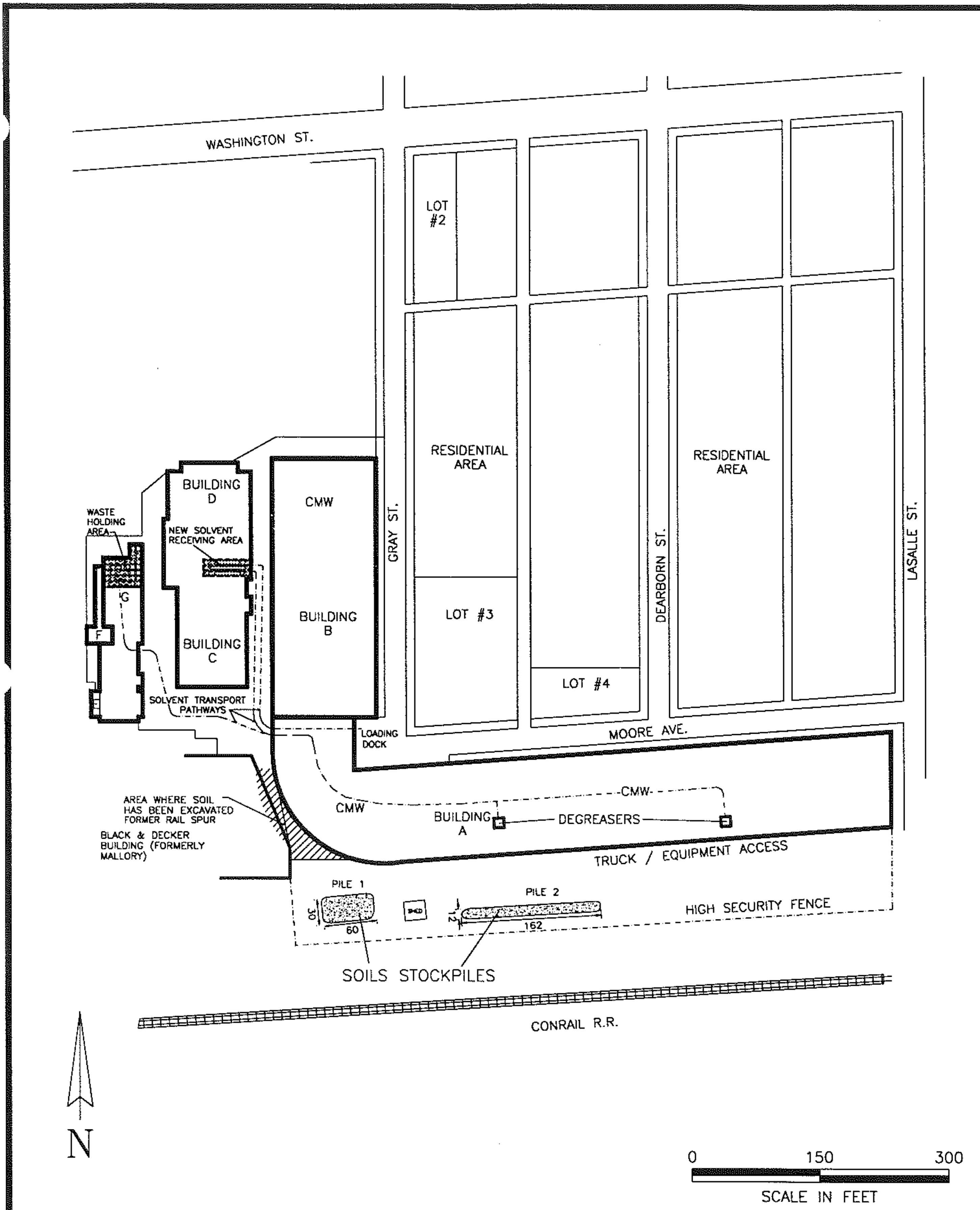
SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP, INDIANAPOLIS EAST, INDIANA QUADRANGLE

0 1000 2000 3000 4000 5000

SCALE IN FEET

N

SECOR INTERNATIONAL INCORPORATED	PREPARED FOR CMW, INC.	SITE LOCATION MAP CMW, INC. INDIANAPOLIS, INDIANA	CADD FILE NO. – CADD DATE 1/5/96 SCALE 1" = 2000' PROJECT NO. R0054-001-01 FIGURE NO. 1 REV. 0 PG.NO. –



SECOR INTERNATIONAL INCORPORATED	PREPARED FOR CMW, INC.	SITE LAYOUT MAP CMW, INC. INDIANAPOLIS, INDIANA	CADD FILE NO. R054011A	CADD DATE 1/5/96
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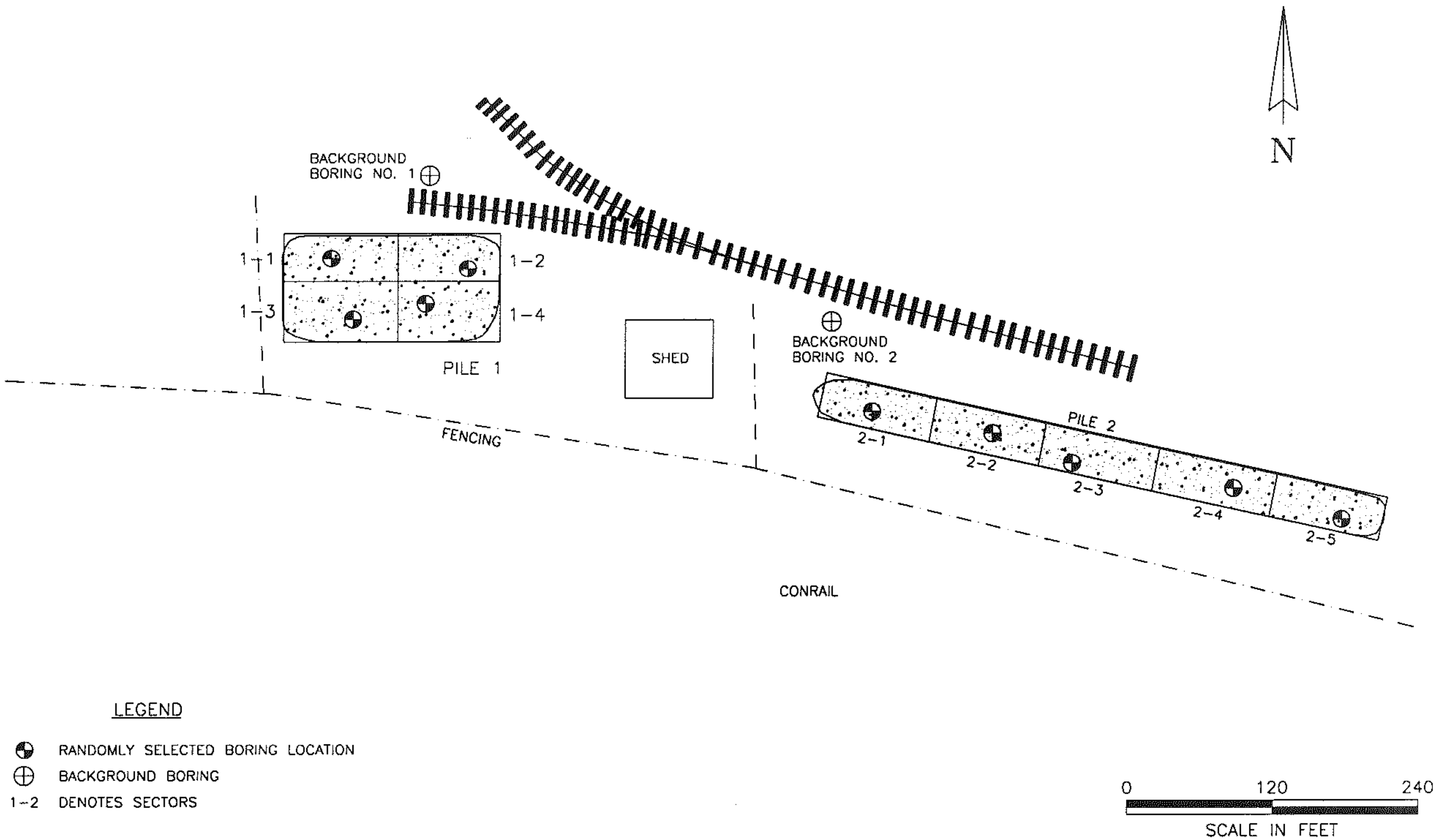
			PROJECT NO. R0054-001-01	
			FIGURE NO. 2	REV. 0 PG.NO. -



NOTE: SPATIAL RELATIONSHIPS ARE APPROXIMATE

DESIGNED BY - DRAWN BY CL CHECKED BY GB APPROVED BY - DATE 1/5/96	SECOR INTERNATIONAL INCORPORATED	PREPARED FOR CMW, INC.	BORING LAYOUT MAP CMW, INC. INDIANAPOLIS, INDIANA	CADD FILE NO. R054011B CADD DATE 1/5/96 SCALE 1" = 120' PROJECT NO. R0054-001-01 FIGURE NO. 3 REV. 0 PG.NO. -

ATTACHMENT C

WRITTEN CORRESPONDENCES

ATEC Associates, Inc.
Corporate Office
8665 Bash Street
P.O. Box 501970
Indianapolis, Indiana 46250-6970
(317) 577-1761, FAX (317) 842-7308

July 7, 1995

Mr. Victor Windle
Indiana Department of Environmental Management
Office of Solid and Hazardous Waste Management
Plan Review and Permit Section
Room Number 1154N
100 North Senate Ave.
P. O. Box 6015
Indianapolis, IN 46206-6015

Re: Soil Waste Pile Closure
CMW, Incorporated
70 South Gray Street
Indianapolis, Indiana
U.S. EPA I.D. Number IND 089 263 412

Dear Mr. Windle:

On behalf of Contacts Metals Welding, Incorporated (CMW), ATEC Associates, Inc. (ATEC) has prepared this letter to document the discussions and agreements reached in a meeting held on June 14, 1995, at the Indiana Department of Environmental Management (IDEM) among Lewis Beckwith of Baker & Daniels, Howard Johnston of CMW, myself, and three IDEM representatives, including Paula Bansch, Michelle Timmermann, and Ruth Ireland. We appreciated your staff taking the time to meet with us. The reason for the meeting was to seek further clarification and agreement on several points of concern regarding closure of the soil piles at CMW, including some issues discussed in our letter to you dated December 16, 1994.

The first issue discussed concerned IDEM's willingness to allow the U.S. EPA to provide IDEM with a formal technical review of ATEC's Risk Assessment of the soil piles. Ms. Bansch indicated that the U.S. EPA's proposal in this regard is acceptable to IDEM and that IDEM is in the process of formally accepting the U.S. EPA's offer of assistance. Presuming that the U.S. EPA finds ATEC's Risk Assessment acceptable, Ms. Bansch stated that IDEM is willing to allow the disposal of the soils in accordance with the proposed Consent Agreement and Final Order (CAFO).

The second issue discussed concerned the process to achieve closure of the soil piles, bearing in mind the potential presence of pre-existing contamination beneath and around the soil piles. Discussion centered on the clean closure criteria. We reiterated the technical approach provided in our letter dated December 16, 1994, in which we proposed to remove an additional one foot of soil beneath and away from the soil piles and our rationale for determining clean closure. However, after further discussion with IDEM regarding the removal of this one foot layer of soil without prior testing, CMW has reconsidered this approach and now favors leaving the one foot layer in-place until after proper characterization of this soil. CMW's revised approach is to conduct a set of borings to five feet beneath the base of the piles once the piles and underliner have been removed. Under our rationale, clean closure without the need for decontamination would be achieved 1) at locations where contaminants[1] are not present in any of the samples, 2) if contaminants present in the subsoils do not match the types of contaminants in the piles, or 3) where contaminants matching those in the piles are present, but increase or remain relatively constant to the full depth of the boring. In those borings in which contaminants matching those in the piles are present, but increase or remain relatively constant to the full depth of the boring, it will be presumed that the contaminants pre-existed the soil piles. Thus, when contaminants matching those in the piles are present near the surface and then significantly decrease with depth to non-detect within the limits of the five foot boring, it will be assumed that clean closure has not been achieved and that decontamination is needed. Ms. Bansch indicated on behalf of IDEM that this process of interpreting the boring results and accomplishing clean closure is acceptable; however, Ms. Bansch stated that IDEM could not comment on the acceptability of the proposed boring program, pending review of the closure plan.

The third issue discussed concerned disposal of any additional contaminated soils excavated to accomplish clean closure of the soil piles. We explained that CMW proposes to dispose of such soils as non-hazardous solid waste, assuming it is contaminated at levels deemed acceptable by the U.S. EPA's review of ATEC's Risk Assessment. Ms. Bansch stated that if the U.S. EPA finds ATEC's Risk Assessment acceptable, IDEM will interpret U.S. EPA approval as applying only to soils in the soil piles and, therefore, as allowing only disposal of soils in the soil piles as non-hazardous solid waste. IDEM will not permit the additionally excavated soils to be disposed of in the same manner as the soils in the piles unless it is part of a risk assessment, subject to review and approval by the U.S. EPA. As a point of emphasis, as was stated in the meeting, resolution of this matter is of particular importance to CMW, in order to achieve a certifiably clean closure of the soil piles and create a clear distinction between the soil pile closure and the pre-existing contamination to be addressed in a revised Modified Sampling, Analysis, and Cleanup Plan (MSACP).

[1] that is, the seven volatile organic compounds of concern found in the soil piles

The final issue discussed was the acceptability of using a risk assessment in the implementation of the MSACP. Ms. Bansch indicated on behalf of IDEM that the use of a risk assessment may be an acceptable approach, as provided in IDEM's Hazardous Waste Management Unit Closure Guidance, dated March, 1994. Ms. Bansch explained that an outside party would review the risk assessment at CMW's expense. Although the MSACP is not a Closure Plan per se, it is envisioned that a process similar to that depicted in Attachment 2 of the Hazardous Waste Management Unit Closure Guidance will be followed. As with a closure plan, the extent of contamination must first be determined before a review of the MSACP risk assessment is conducted. CMW is proposing to submit the revised MSACP 90 days after receipt of approval of the soil pile Closure Plan.

We trust this letter is an accurate reflection of the outcome of the meeting of June 14th and has served to clarify CMW's intentions in this matter. If you have any specific questions regarding the content of this letter, please do not hesitate to contact the undersigned at (317) 577-1761, extension 4744. In the absence of questions or disagreements, we would appreciate your written confirmation that this letter accurately reflects the positions stated and agreements reached in our meeting. We look forward to your response.

Very truly yours,

ATEC Associates, Inc.

Gregory B. Byer

Gregory B. Byer, P.E., C.P.G.
Director of Geological Services

cc: Mr. Howard Johnston, CMW, Inc.
Mr. Lewis Beckwith, Baker & Daniels
Mr. Mike Cunningham, U.S. EPA Region V
Ms. Michelle Timmermann, IDEM

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

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Commissioner

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P.O. Box 6015
Indianapolis, Indiana 46206-6015
Telephone 317-232-8603
Environmental Helpline 1-800-451-6027

VIA CERTIFIED MAIL - Z339-826-203

August 25, 1995

Mr. Gregory Byer
Director of Geological Services
ATEC & Associates, Inc.
8665 Bash Street
P.O. Box 501970
Indianapolis, Indiana 46250-6970

Re: Soil Waste Pile Closure
CMW, Inc.
Indianapolis, Indiana
IND 089263412

Dear Mr. Byer:

The Indiana Department of Environmental Management (IDEM) acknowledges receipt of your letter dated July 7, 1995 detailing the positions of CMW, Inc. and the IDEM regarding the closure of soil waste piles at the CMW facility. The aforementioned letter accurately reflects the discussion at the meeting held on June 14, 1995 at the IDEM with you; Lewis Beckwith, Baker & Daniels; Howard Johnston, CMW; and representatives of the IDEM in attendance.

If you have any further questions regarding this matter, please contact Ms. Michelle Timmermann at 317/232-3264.

Sincerely,

Victor P. Windle

Victor Windle, Chief
Hazardous Waste Permit Section
Hazardous Waste Facilities Branch
Solid and Hazardous Waste Management

MLT

Signed +
mailed to
IDEM on 9/1?/95

HRE-8J

Victor Windle, Chief
Hazardous Waste Permit Section
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, Indiana 46206-6015

Re: Risk Assessment of Waste Piles
at CMW, Inc. (IND 089 263 412)

Dear Mr. Windle:

The United States Environmental Protection Agency, Region 5 (U.S. EPA), is willing to provide technical assistance to the Indiana Department of Environmental Management (IDEM), Hazardous Waste Permit Section regarding the Risk Assessment completed by ATEC Associates, Incorporated for the waste piles at Contacts Metals Welding, Incorporated (CMW) located at 70 South Gray Street, Indianapolis, Indiana (ATEC Project No. 11-07-93-00040).

U.S. EPA intends to conduct a formal review of this risk assessment in accordance with U.S. EPA guidance documents, including the U.S. EPA, December, 1989, Risk Assessment Guidance for Superfund: Volume I-Human Health Evaluation Manual (EPA/540/1-89/002) and the U.S. EPA, March, 1991, Risk Assessment Guidance for Superfund: Volume I- Human Health Evaluation Manual, Supplemental Guidance- "Standard Default Exposure Factors" (OSWER Directive 9285.6-03).

U.S. EPA will focus on specific criteria, including:

a) Receptors, both adults and children, in the following populations: future on-site residents, future construction workers, future on-site industrial workers, current and future trespassers, and current off-site residents.

b) Routes of exposure, including ingestion, dermal contact, and inhalation of both particulates and volatilized chemicals which were detected in the soil.

c) Detected chemicals of concern, including: chloroform, 1,1-dichloroethane, 1,1-dihloroethene, 1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene.

d) Existing analytical data from the soil used to calculate the human health risks.

U.S. EPA will provide comments regarding any deficiencies in the risk assessment. U.S. EPA will also determine whether the risks outlined in the assessment were calculated accurately and will offer an opinion as to whether the risk represents an acceptable level pursuant to current U.S. EPA guidance. It is within IDEM's discretion to use this information in their determination of whether hazardous waste remains in the piles at CMW.

Sincerely yours,

Laura Lodisio, Chief
Technical Enforcement Section 2
RCRA Enforcement Branch, Region 5

BAKER & DANIELS
EST. 1863

COPY

300 NORTH MERIDIAN STREET, SUITE 2700 · INDIANAPOLIS, INDIANA 46204-1782 · (317) 237-0300 · FAX (317) 237-1000

LEWIS D. BECKWITH
(317) 237-1406

INDIANAPOLIS
FORT WAYNE
SOUTH BEND
ELKHART
WASHINGTON, D.C.

September 27, 1995

BY HAND DELIVERY

Mr. Victor Windle
Indiana Department of Environmental
Management
Indiana Government Center North
100 N. Senate Avenue
Indianapolis, Indiana 46206

Re: CMW, Incorporated
70 S. Gray Street
Indianapolis, Indiana
RCRA Dkt. No. V-W-15-93

Dear Mr. Windle:

As you know, CMW has prepared and submitted to U.S. EPA and IDEM a site-specific human health risk assessment of soils in the soil piles at CMW. The purpose of the site-specific human health risk assessment is to demonstrate that soils in the soil piles at CMW no longer contain hazardous waste. CMW prepared and submitted its site-specific human health risk assessment using criteria to which U.S. EPA agreed in advance.

Yesterday, U.S. EPA made changes at IDEM's request to paragraph 10 of the stipulations in the proposed consent agreement and final order ("CAFO") between U.S. EPA and CMW in the above-referenced matter. The changes may affect IDEM's decision as to whether CMW's site-specific human health risk assessment demonstrates that the soil piles no longer contain hazardous waste. To address that issue, I am submitting this letter on behalf of CMW.

As changed at IDEM's suggestion, paragraph 10 of the stipulations now provides that "IDEM . . . will make the ultimate decision on the adequacy of closure of the waste piles . . ." and that "application to the CMW waste piles of the principles set forth in the August 22, 1991 letter from IDEM to CMW is allowable and appropriate." As now changed, paragraph 10 raises the question whether the principles concerning risk assessment set forth in the August 22, 1991 letter from IDEM to CMW are the same ones under which CMW prepared and submitted its site-specific risk assessment.

CMW prepared and submitted its site-specific human health risk assessment using criteria reiterated to you in U.S. EPA's September 15, 1995 letter. They are:

- Receptors would be restricted to humans, both adults and children, in the following populations: future on-site residents, future construction workers, future on-site industrial workers, current and future trespassers, and current off-site residents.

- Media of concern and routes of exposure would be restricted to ingestion, dermal contact, and inhalation of particulates and volatilized chemicals in soils in the soil piles.

- Chemicals of concern would be restricted to data existing at the time of entry of the CAFO with regard to chloroform, 1,1-dichloroethane, 1,1-dichloroethene, total 1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene in soils in the soil piles.

- Otherwise, the site-specific human health risk assessment would need to be prepared in accordance with U.S. EPA, Dec., 1989, Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Part A) (Interim Final) (EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington, D.C., and U.S. EPA, March, 1991, and U.S. EPA, March, 1991, Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual Supplemental Guidance - "Standard Default Exposure Factors" Interim Final (OSWER Directive 9285.6-03), Office of Solid Waste and Emergency Response and Office of Emergency and Remedial Response; Washington, D.C.

It is possible to read IDEM's August 22, 1991 letter to CMW as authorizing or requiring a site-specific human health risk assessment to be conducted using criteria different than or in addition to those authorized by U.S. EPA. Consequently, by this letter, CMW requests IDEM to confirm, in writing, that a site-specific human health risk assessment using the factors set forth above will satisfy the "principles set forth in the August 22, 1991 letter from IDEM to CMW."

Finally, by letter to you dated August 30, 1995, ATEC Associates, on behalf of CMW, requested IDEM to respond by September 8, 1995 if IDEM disagreed with ATEC's clarification in its letter of August 30, 1995 that only one site-specific human health risk assessment would be used to address both soils in the soil piles and any subsoils contaminated by the soil piles. I realize that negotiations with U.S. EPA may have distracted you from responding to ATEC's August 30, 1995 letter. If you disagree with any part of ATEC's August 30, 1995 letter, would you be so kind as to bring your concerns promptly to my attention, either by telephone or in your written response to this letter?

Thank you very much for your continuing attention to this matter.

Sincerely yours,

Lewis D. Beckwith

Attorney for CMW

LDB:dba

cc: Howard Johnston
Greg Byer✓
Mike Cunningham
Tim Thurlow

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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Environmental Helpline 1-800-451-6027

VIA CERTIFIED MAIL Z 339 775 880 October 3, 1995

Mr. Lewis Beckwith
Baker & Daniels
300 North Meridian Street, Suite 2700
Indianapolis, Indiana 46204-1782

Re: Soil Waste Pile Closure
Contact Metals Welding
Indianapolis, Indiana
IND 089263412

Dear Mr. Beckwith:

The Indiana Department of Environmental Management (IDEM) acknowledges receipt of your letter dated September 27, 1995 which raises concerns regarding the revised language in paragraph 10 of the stipulations in the proposed consent agreement and final order (CAFO) between U.S. EPA and Contact Metals Welding (CMW). Your letter suggests that the revised language, which now references the August 22, 1991 letter from IDEM to CMW, changes the principles for review of the risk assessment submitted by CMW. It is the position of the IDEM that the revised language does not affect the specific criteria by which EPA has chosen to review the CMW risk assessment. The receptors, routes of exposure and chemicals of concern will remain the same as those outlined in the September 19, 1995 letter from EPA to IDEM.

In your letter, you also raised questions regarding the August 30, 1995 letter from ATEC Associates, on behalf of CMW, to IDEM requesting clarification that only one site-specific risk assessment would be used to address both soils in the soil piles and any subsoils contaminated by the soil piles. IDEM interprets the language in paragraph 10 of the stipulations to allow that both the soil piles and the subsoils contaminated by the soil piles may be addressed under the same risk assessment assumptions. Obviously, the IDEM could not answer ATEC's question relating to stipulation 10 until the EPA's covert changes to stipulation 10 were addressed. I am hopeful that my diligent communication with you regarding the status of this issue was shared with ATEC.

If you have any further questions regarding this matter, please contact Ms. Michelle Timmermann at 317/232-3264.

Sincerely,

Victor P. Windle

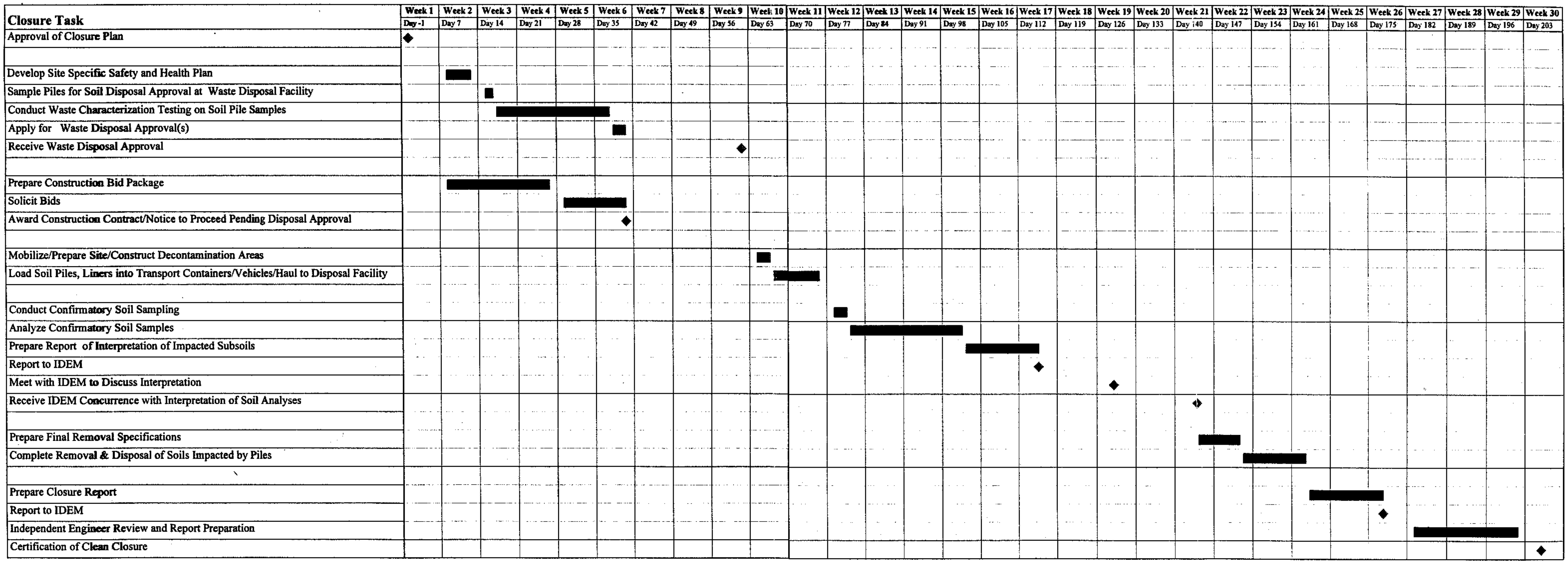
Victor P. Windle, Chief
Hazardous Waste Permitting Section
Hazardous Waste Facilities Branch
Solid and Hazardous Waste Management

cc: Mr. Mike Cunningham, U.S. EPA Region 5
Mr. Howard Johnston, CMW
Mr. Greg Byer, ATEC

ATTACHMENT D

CLOSURE SCHEDULE

CMW, Inc.
CLOSURE PLAN SCHEDULE



ATTACHMENT E

RISK ASSESSMENT - STOCKPILED SOILS

RISK ASSESSMENT -
STOCKPILED SOILS
CMW, Inc.
Indianapolis, Indiana
ATEC Project No. 11-07-93-00040

Prepared For:
CMW, Inc.
70 South Gray Street
Indianapolis, Indiana 46201

Attn: Mr. Howard Johnston

March 19, 1994

ATEC® Associates, Inc.
Corporate Office
8665 Bash Street
P.O. Box 501970
Indianapolis, Indiana 46250-6970
(317) 577-1761, FAX (317) 842-7308

March 19, 1994

Mr. Howard Johnston
CMW, Inc.
70 South Gray Street
Indianapolis, Indiana 46201

RE: **Risk Assessment - Stockpiled Soils**
CMW, Inc.
Indianapolis, Indiana
ATEC Project No. 11-07-93-00040-02

Dear Mr. Johnston:

ATEC Associates, Inc. (ATEC) has completed the Risk Assessment for the Stockpiled Soils located at CMW, Inc., in Indianapolis, Indiana.

This Risk Assessment details various exposure scenarios involving human adults and children relative to the soil stockpiles as they exist at present. In this Risk Assessment ATEC identified seven chemicals of concern, four being known or suspected carcinogens, in the stockpiled soils on which to base the various exposure scenarios. The results of this Risk Assessment show that even in the worst case, which is future on-site resident children, this soil should not be considered hazardous to humans with a total cancer risk less than one in a million (10^{-6}).

We trust this submittal is responsive to your needs. If you have any questions or comments regarding this report, or if we can be of further service to you, please do not hesitate to contact us.

Sincerely,

ATEC ASSOCIATES, INC.

Susan S. Laflin
Susan S. Laflin, C.H.M.M.
Project Environmental Scientist

Gregory B. Byer
Gregory B. Byer, P.E., C.P.G.
Associate Vice President
Director of Geological Services

John A. Mundell GBB
John A. Mundell, V.P., P.E.
Associate Vice President
Corporate Director, Technical Services

cc: Lewis D. Beckwith, Baker & Daniels
Timothy Thurlow, Esq., U.S. EPA, Region V (3 copies)

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ATEC ASSOCIATES, INC.

HUMAN HEALTH RISK ASSESSMENT

CMW, Inc.

70 South Gray Street

Indianapolis, Indiana

1.0 INTRODUCTION

The human health risk assessment performed in this report estimates the potential risks that could occur as a result of exposure to identified chemicals of concern contained within stockpiled soil at the CMW, Inc. facility at 70 South Gray Street in Indianapolis, Indiana. A brief description of the performance and organization of this human health evaluation is provided. The format for this risk assessment follows the United States Environmental Protection Agency's (USEPA's) guidelines under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

1.1 Overview and Objectives

The overall objective of this risk assessment is to identify chemical risks associated with excavated soil stockpiles at the CMW site and to describe how those chemicals may have an effect on human health. This risk assessment follows the USEPA's "Risk Assessment Guidance for Superfund: Volume I-Human Health Evaluation Manual" (USEPA, 1989c) as supplemented by "Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" (USEPA, 1991a) and other generally recognized risk assessment guidance developed by the USEPA. (See references in Section 9.0)

This risk assessment evaluates the potential human health risks associated with two soil stockpiles located on the southern edge of the site under the no-action alternative, i.e., in the absence of remedial and corrective action. The soil was excavated from an area beneath a former railroad spur between two adjacent buildings and stored in covered piles. These soils contain organic chemicals of potential concern.

The overall objectives of the risk assessment are:

- to quantify the risk presented by chemicals of concern in the stockpiled soil at the time of excavation;
- to quantify the potential health risks posed by chemicals of concern in the stockpiled soil, now or in the future, in the absence of remedial action;
- to potentially serve as a basis for dialogue with the community about understanding of the risks posed by chemicals of concern in the stockpiled soil;
- to provide a basis for estimating levels of chemicals of concern in the stockpiled soil that can remain at the site and still be protective of public health based on qualitative and quantitative analysis of contaminants; and
- to provide data to later characterize potential health impacts of remedial alternatives, if needed.

This risk assessment will evaluate the potential human health impacts associated with the stockpiled soil based on current and future uses of the site. For purposes of this risk assessment, both the average and the "worst case" scenarios are assumed. The focus of the receptor evaluations is on future hypothetical on-site residents, trespassers, on-site workers, future temporary construction workers, and off-site residences. Pathways evaluated include ingestion of soil, dermal contact with soil, and inhalation of soil vapors and particles. Although the use of the site is currently industrial and is assumed to be industrial in the future, the selected scenarios serve to generate risk levels that are realistic, yet extremely conservative for this site.

This risk assessment has the following nine sections:

1.0 Introduction
- Overview and objectives
- Site background
- Scope of risk assessment

2.0 Summary and Evaluation of Analytical Data
- Review of appropriateness of sample quantitation limits
- Selection of chemicals of concern

3.0 Identification of Chemicals of Concern
- Identification of chemicals of human health concern
- Summary of chemicals of concern by media

4.0 Site Conceptual Model

5.0 Human Health Exposure Assessment
- Identification of human health exposure pathways
- Quantification of human health exposure
- Uncertainties in the human health exposure assessment

6.0 Human Health Toxicity Assessment
- Toxicity assessment for noncarcinogenic effects
- Toxicity assessment for carcinogenic effects
- Toxicity summary of chemicals of concern
- Uncertainties related to human health toxicity information

7.0 Human Health Risk Characterization
- Noncarcinogens
- Carcinogens
- Summary of carcinogenic and noncarcinogenic risks by scenario

8.0 Summary of Human Risk Evaluation

9.0 References

1.2 Site Background

The site is located in a mixed manufacturing, commercial and residential area on the east side of Indianapolis, Indiana (See Figure 1 - Site Vicinity Map, Appendix A). The site is directly adjacent to a rail yard.

The site consists of five buildings on approximately 6 acres of land. The buildings have a total of about 200,000 sq. ft of floor space. CMW operates the facility and produces components such as silver alloy wire, strips, rotors, heat sinks, contacts, welding tips and other parts. Primary manufacturing processes include machining, press operations, metal infiltrating, electroplating, heat treating, sintering, degreasing, foundry operations and cold rolling. The general use of the floor space includes 135,000 sq. ft for manufacturing, 30,000 sq. ft for offices and 35,000 sq. ft is empty. Figure 2, the Site Layout Map in Appendix A, illustrates the site.

The following structures are located on the site:

- **Building A** houses virtually all of the manufacturing operations at the site. The building is located south of Moore Avenue between Gray and LaSalle Streets. Records indicate the building was constructed about 1951.

- **Building B** extends north from Building A on the west side of Gray Street. Records indicate the building was constructed about 1941.

- **Buildings C and D** are located in a single structure west of Building B. Building C occupies the southern portion of the structure. Building D is located north of Building C.

- **Buildings E, F and G** are located in a single structure west of Buildings C and D.

- A small storage building is located near the southwest corner of Building A.

Two asphalt covered employee parking lots are located north of Moore Avenue and east of Gray Street. The land south of Building A is covered with cinders and gravel. This area was formerly used for employee parking. The remaining exterior portions of the site are covered with asphalt or concrete.

1.2.1 Historic Site Use

Marion County records, Indianapolis Sanborn Fire Insurance Maps, on-site interviews with Mr. Howard Johnston and a review of Indianapolis City Directories indicate that the historical use of the property has been manufacturing. PR Mallory began operating a manufacturing facility northwest of the site about 1929. The Mallory facility increased its size through the middle 1950s. It appears the buildings which make up the CMW plant were built between 1941 and 1951 on primarily residential land. The eastern portion of Building A was constructed on a coal yard.

Mr. Johnston stated that CMW was formed in 1978 and purchased selected assets from Mallory in that same year. At that time CMW assumed a lease for the site. In 1981, the site was purchased by CMW from Emhart. Emhart had acquired the site through various mergers involving Mallory and its assets. Mr. Johnston also stated that the general manufacturing processes at the site have not changed significantly since the 1950s.

ATEC reviewed aerial photographs of the site dated 1936, 1941, 1956, 1962, 1972, 1978 and 1985. The 1936 aerial photograph showed the site as residential property. An apparent coal storage yard was identified at the east end of the site. A large commercial building was located east of the coal yard. A manufacturing facility was observed north of the site along Washington Street. The 1941 photograph was similar to the 1936 photograph with the apparent addition of Buildings B and C/D of the CMW facility. The 1956 through 1985 photographs show the site generally as it appears today.

1.2.2 Adjacent Property

The site is located in a mixed manufacturing, commercial and residential area on the east side of Indianapolis, Indiana. Adjacent land uses include Consolidated Liquidators to the northwest, west and southwest; Consolidated Rail Corporation (Conrail) railroad tracks and right-of-way to the south; Central Engineering and Construction to the east; and residential property to the north and northeast. Property north of the site along Washington Street is primarily occupied by restaurants and auto body repair shops. Residential land is located south of the Conrail railroad right-of-way.

Consolidated Liquidators occupies buildings formerly owned and operated by PR Mallory who used the buildings for manufacturing. Consolidated Liquidators currently uses the buildings primarily for storage.

1.2.3 Geologic Setting

The site has a generally level topography. The Indianapolis East, Indiana Quadrangle Topographic Map (USGS, 1980) indicates the ground surface has an elevation of approximately 765 ft above mean sea level (MSL). Regionally, the ground surface slopes to the southeast in the project area.

Runoff at the site is controlled by gutters and sewers. Pleasant Run Creek, approximately 3,000 feet southeast of the site, drains the study area. This creek flows southwest and is a tributary of the White River with confluence approximately 4.5 miles to the southwest.

The U.S. Department of Agriculture Soil Survey of Marion County classifies the soil at the site as Urban land - Miami Complex. The Miami series consists of level, well drained soils on gently undulating uplands. These soils have a moderate permeability.

Trafalgar Formation loam till of Pleistocene age forms the uppermost section of unconsolidated material below the site. The loam till has a thickness of approximately 90 ft. and a complex and unstratified composition. In the lower portions of the till section and beneath lie relatively thin beds of glaciofluvial outwash which rest upon bedrock surface.

Middle Devonian Limestones and Dolomites are the bedrock below the site. The surface of the bedrock has an elevation of approximately 660 ft above MSL. Regionally the bedrock surface slopes to the southwest in the study area.

Regional groundwater flow direction is generally influenced by major hydrogeologic features such as a river or lake. Surface and/or bedrock topography may also influence regional groundwater flow direction. The available hydrogeologic information indicates that the regional groundwater flow is southwest toward the White River Outwash Valley. It should be noted that local geologic features may cause local groundwater flow direction to differ from the regional flow direction. The Pleistocene outwash aquifer has a potentiometric surface approximately 60 feet below ground surface at the site. The potentiometric surface for the bedrock aquifer lies approximately 100 feet below ground surface.

1.3 Scope of Risk Assessment

This risk assessment (RA) is site-specific and contains the following four steps:

- Data Collection and Evaluation;
- Exposure Assessment;
- Toxicity Assessment; and
- Risk Characterization.

Step 1: Data collection and evaluation serve to validate whether all the data is sufficient to be used in the risk assessment. The process reviews critically the blanks, sensitivity quantitation limits (SQLs), and results of chemical analysis in each medium. Results of the data evaluation allows the next step: the identification of the chemicals of concern. The detailed discussions of selection of the chemical(s) of concern are described in the later section of this risk assessment.

Step 2: Exposure assessment is the next step to evaluate possible exposure pathways by human receptors to the chemicals of concern, which are usually evaluated per medium. Predictions must be made regarding how people will come in contact with the chemicals of concern at the site. The combination of a concerned medium, a human activity and environmental conditions resulting in contact with the medium, is known as the exposure scenario. In this risk assessment, the human exposure scenario includes hypothetical resident adults and children, potential adult and child trespassers, off-site residents, on-site workers and temporary construction workers. Exposure scenarios are focused on soil through ingestion, dermal contact and inhalation. Exposures were not evaluated for groundwater.

Step 3: The next step in the risk assessment involves evaluation of the potential risks to human receptors identified in the exposure assessment, based on the toxicity of chemicals of concern though the applied exposure media. The identified chemicals of concern are evaluated for various effects on humans and the environment. Most toxicity information is obtained through EPA's Integrated Risk Information System (IRIS) or other published scientific journals pertinent to a specific chemical and documents prepared by the USEPA.

Step 4: The final step of the risk assessment quantifies the potential risks that may occur due to different pathways. Total risk estimates from each exposure pathway from all the chemicals of concern and a cumulative risk calculated for all media are obtained from exposures to the chemicals of concern associated with the site. The results of a total risk per receptor are characterized and concluded.

2.0 SUMMARY AND EVALUATION OF ANALYTICAL DATA

Two data sets will be used for this risk assessment: one representative of the current condition of the soil piles and a second that is representative of the soil as it was excavated. This approach allows for the determination of the risk associated with the highest levels of impacted soil.

The chemical data collected during past sampling events were examined for potential use in this risk assessment. Data was critically examined against a number of criteria to select chemicals of concern to be included in the risk assessment according to Guidance for Data Useability in Risk Assessment (USEPA, 1990). The review process was used to:

- Determine levels of chemicals in the excavated soils at the site;
- Evaluate whether the analytical data are adequate to identify and examine exposure pathways; and
- Evaluate whether the analytical data are adequate to fully characterize exposure pathways.

Table B-1 in Appendix B summarizes analytical data gathered for the soil piles (see Appendix A, Figure 2 for pile locations) in late 1991, and Table B-2 in Appendix B presents data gathered during the actual excavation (see Appendix A, Figure 2 for location of excavation) of the soil in 1989.

This section summarizes the data evaluation process briefly. The results of the evaluation were used to select the chemicals of concern. The criteria used to select the chemicals of concern are summarized in the discussions below.

2.1 Review of Appropriateness of Sample Quantitation Limits (SQLs)

Soils, unlike groundwater, do not have generally accepted guidance values or standards to directly compare detection limits. The instrument detection limit (IDL) and contract required detection limit (CRDL) for each chemical is listed in an EPA document (Data Quality Objectives for Remedial Response Activities EPA March 1987). Therefore, the preliminary evaluation of the detection limit was not performed for soils and sediments.

All data presented in this report were collected primarily for the purpose of confirmation of the presence of volatile organics. The laboratory used was approved by the State of Indiana for performance of the required tests. All samples were submitted to the ATEC analytical laboratory in Indianapolis, IN. The soil samples were tested via SW-846 Method 8240 and QA/QC aqueous blanks were tested via USEPA Method 624.

In addition to the laboratory's own QA/QC, Analytical results were compared by the Project Manager to the laboratory's internal QA/QC samples and/or sampler-derived QA/QC samples (field and trip blanks and duplicates). Validation was conducted using available QA/QC samples to identify potential outliers and artifacts.

2.2 Selection of Chemicals of Concern

The selection of chemicals of concern is to identify the chemicals most likely to contribute to potential risks to humans and the environment. The identification of chemicals of concern is based on the results of data review and data validation described as part of the selection criteria in the previous section. The objective of the chemical selection process is to review the available site data against a number of criteria to determine their usability in the risk assessment. The chemicals selected as chemicals of concern (COCs) are those applied to the quantitative risk assessment.

The chemical selection process in this case includes evaluation of the following factors:

1. General review of analytical methods and attained detection limits; and
2. Presence of chemicals in field, trip, or method blanks.

Each criterion is discussed and applied in the following subsections.

2.2.1 General Review of Site Data

Soil samples were collected from the open excavation or the soil piles to identify chemicals most likely to impact the site (see Appendix B for results). In order to characterize the nature and extent of contamination in the soil stockpiles, analyses were performed for the following class of chemicals:

- Volatile Organic Compounds (VOCs, 29)

The number in parenthesis denotes the number of analyses within the class of chemicals for which analyses were performed. The general quality of the data was examined to evaluate whether the data were appropriate for use in a risk assessment.

2.2.2 Presence of Chemicals in Field, Trip or Method Blanks

Some chemicals were identified in field or trip (sampling) or method (laboratory) blanks. A sample containing a chemical also present in the associated blank was considered positive only if it contained ten times more than the blank for common laboratory contaminants; or five times more than the blank for other chemicals (per USEPA guidance, "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses," 1988). If the chemical in the sample could be attributed to blank contamination by this criterion, the amount in the blank was defined as the detection limit by the sample and the sample was considered a "non-detect" at that detection limit.

Some chemicals were identified as laboratory contaminants based on the results of the method blanks. Chemical contamination occurs as a result of both sampling and laboratory manipulation. The following chemicals were frequently detected in field, method or trip blank samples:

Compound
Methylene Chloride
Acetone
2-Butanone
Toluene

The chemical concentration detected in the site sample was compared with the concentration detected in the blank to evaluate whether the presence of the chemical in the sample could be attributed to sampling or laboratory introduction according to the following criteria:

1) If the blank contained detectable levels of common laboratory contaminants (acetone, 2-butanone, methylene chloride, toluene, phthalate esters; Risk Assessment Guidance for Superfund (RAGS), EPA 540/1-89/002, 12/89), then the sample result was considered positive if the concentration in the sample was greater than ten times the maximum amount detected in the blank.; and

2) For chemicals not considered to be a common laboratory contaminants (all other chemicals), the site sample was considered positive if it contained the chemical at a concentration greater than five times the amount in the blank.

If, by these criteria, the sample result was considered to be an artifact of contamination, the concentration was adapted as default detection limit and the sample was considered to be a "non-detect" at that detection limit.

3.0 IDENTIFICATION OF CHEMICALS OF CONCERN

The seven chemicals that have been detected at the site and not eliminated based on criteria discussed above are as follows:

- Chloroform
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- Total 1,2-Dichloroethene
- Tetrachloroethene
- 1,1,1-Trichloroethane
- Trichloroethene

3.1 Identification of Chemicals of Human Health Concern

This section discusses the relationship between the above chemicals and the media of concern.

3.1.1 Media of Human Health Concern

This subsection of the exposure assessment describes the site characterization/exposure setting data presented in previous subsections to identify potential exposure pathways at the site. The media of concern for purposes of this evaluation is strictly the two on-site soil piles. Primarily, ingestion and dermal contact with the soil itself are the routes of exposure. The other evaluated exposure pathway is the inhalation of either the particulates or vaporized chemicals from the soils in the stockpiles by individuals both on-site and off-site. The following subsections describe the possible media of concern for human receptors.

3.1.1.1 Soils and Human Receptors

Human receptors can be exposed to soils with the chemicals of concern by direct contact, air and dust, and the particulates and volatilized chemicals produced by wind erosion. To summarize, the following are possible exposure pathways by soils:

- Ingestion of soils with chemicals of concern;
- Dermal contact of soils with chemicals of concern;
- The particulates and volatilized chemical inhalations from soils by wind erosion.

3.1.1.2 Surface Water and Human Receptors

Stormwater runoff from the site is collected by gutters, primarily from the roofs of the buildings. The water is discharged to a sewer. The City of Indianapolis has been unable to determine if the sewer line is a dedicated storm sewer or a combined sanitary and storm sewer. Since the status of the sewer is unknown, a National Pollutants Discharge Elimination System (NPDES) permit for stormwater discharge at the facility has not been required.

The soil piles have been covered with plastic and maintained since they were created in 1989. The runoff from the coverings is not collected in the stormwater runoff system, but is allowed to percolate. Since the soils are entirely encapsulated by plastic, precipitation does not actively transport soil or contamination either in suspension or solution.

3.1.1.3 Groundwater and Human Receptors

The overall objective of this risk assessment is to identify chemical risks associated with two excavated soil piles at the CMW site and to describe how those chemicals may have an effect on human health. In a meeting on January 20, 1994, USEPA was in agreement with CMW that a discussion of risk associated with groundwater was beyond the scope of this work for the following reasons:

- The stockpiled soil is, and has always been, covered with plastic, thereby eliminating potentially contaminated runoff;
- Trafalgar Formation loam till forms the unconsolidated materials below the site. The loam till has a thickness of approximately 90 ft. The clay-rich soils are very low in permeability and transport properties are low;
- There is virtually no relief in the topography at the site, and therefore laterally dispersion of fugitive contaminants is considered nil; and
- There are apparently no potable groundwater wells near the site.

It should be noted that groundwater would be evaluated in any future risk assessments performed for the remaining contamination still present in the subsurface beneath the excavation.

3.1.2 Areas of Human Health Concern

The soils that are present in the two covered stock piles are the current concern at the site. This risk assessment is also structured to evaluate the theoretical risk impact from the stockpiled soils at the time of excavation and any future construction activities.

3.1.3 Receptors of Human Health Concern

The following potentially exposed populations are considered and addressed in this section of the human health evaluation:

- Future hypothetical on-site adult and child residents who may be exposed to chemicals of concern via ingestion, dermal contact or inhalation of contaminated soils;

- Future construction workers who may be exposed to contaminants in the soil via ingestion, dermal contact or inhalation of airborne dust during excavation activities;

- Future industrial on-site workers who may be exposed to chemicals of concern via incidental ingestion, dermal contact or inhalation of surficial soil or dust on-site with chemicals of concern;

- Current and future adult and child trespassers who may be exposed to chemicals of concern via ingestion, dermal contact or inhalation; and

- Current off-site adult and child residents who may be exposed to chemicals of concern via inhalation of air borne particulates or volatilized chemicals from the soils.

These scenarios are analyzed in more detail below.

3.1.3.1 Future On-site Residential Populations

There are no current on-site residents. The future on-site residential scenario is an extremely conservative estimation of the risks based on the hypothetical on-site residents scenario. The future hypothetical on-site resident exposure pathways, for both an adult and a child, could potentially contain the following:

- Ingestion of soil;
- Dermal contact with soil;
- Inhalation of particulates from the surface soil; and
- Inhalation of volatilized organic chemicals in air.

Since the issue of concern is the excavated soils placed in the covered soil piles, the ingestion, dermal and inhalation pathways for groundwater are not evaluated in this assessment for the reasons stated above.

3.1.3.2 Construction Workers

Construction workers are possible human receptors in the future, and were assumed to be working for a short period of time near the stockpiled soils. The exposures to soils by all the exposure routes were considered, including an inhalation exposure of volatilized organic chemicals in the surface soils. Assuming there is some soil disturbance by the construction-related work, the soil particulate inhalation exposures were estimated to be a significant exposure route. The future construction worker pathways include:

- Ingestion of soil;
- Dermal contact with soil;
- Inhalation of soil particulates from the stockpiled soils; and
- Inhalation of volatilized organic chemicals in air.

3.1.3.3 On-Site Industrial Workers

There are on-site workers at the site. The site is classified as an industrial site. On-site workers are assumed to be healthy adults, working for 8 hours a day, 5 days a week in the building. The on-site workers will work mainly in the manufacturing building. Potential on-site worker exposure pathways include:

- Ingestion of soil;
- Dermal contact with soil.
- Inhalation of soil particulates from the stockpiled soil; and
- Inhalation of volatilized organic chemicals in air.

3.1.3.4 Trespassing Populations

The site is fenced completely and CMW employs security guards with constant surveillance of the soil stockpile via remote camera. Therefore, the probability of the potential exposure to the chemicals of concern by trespassing populations is low. Trespassing populations are assessed for both children and adults. Because of limited access to the site by fencing, an inhalation exposure is a main exposure pathway for trespassing populations through the soils contaminated with the chemicals of concern.

The current and future exposure pathways by trespassers were assumed to be the same. The trespasser exposure pathways contain:

- Dermal contact with soil;
- Ingestion of soil;
- Inhalation of soil particulates from the stockpiled soil; and
- Inhalation of volatilized organic chemicals in air.

3.1.3.5 Off-site Residential Populations

The area surrounding the subject site is mixed commercial, industrial, and residential. The current off-site residential exposures for both adults and children are fence line exposure scenarios, which represent more realistic exposure pathways. The current off-site resident exposures, for both an adult and a child, contain the following:

- Inhalation of particulates from the surface soil; and
- Inhalation of volatilized organic chemicals in air.

3.1.4 Chemicals of Human Health Concern

This section summarizes the types of chemicals detected in the media of concern that are of human toxicological significance. Tables B-1 and B-2 in Appendix B present the analytical data obtained for the site.

The selection process of chemicals of concern verified each chemical detected in the media so that the chemicals of concern are selected for the risk assessment. The following subsections describe the selection process, the evaluation of the chemical data, and the exclusion or inclusion of chemicals as the chemicals of concern.

3.1.5 Human Health Evaluation Uncertainties

Toxicity information for the chemicals at the site is often limited. Consequently, there are varying degrees of uncertainty associated with the toxicity values calculated. Therefore, this section includes a discussion of the strength of the evidence for principal and supporting studies related to the contaminants.

For noncarcinogenic chemicals, EPA-verified reference doses (RfDs) found in the Integrated Risk Information System (IRIS) are included with a statement of the confidence the evaluators have in the RfD itself. For carcinogenic chemicals, all EPA-verified slope factors (SFs) are accompanied by a weight-of-evidence classification, which indicates the likelihood that the agent is a human carcinogen.

3.2 Summary of Chemicals of Concern by Media

The following chemicals are of potential concern in the soil piles at the site:

- Chloroform
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- Total 1,2-Dichloroethene
- Tetrachloroethene
- 1,1,1-Trichloroethane
- Trichloroethene

As discussed above, no other media are considered in this risk assessment. Future assessments of the risk associated with the contamination remaining in the subsurface will be a comprehensive consideration of relevant media.

4.0 SITE CONCEPTUAL MODEL

The Figure 2 (Appendix A) shows the location of the soil stockpiles relative to the remaining site. The current configuration is relevant for consideration of both current and future exposure scenarios. Because the soil pile is being considered in isolation, contaminant release mechanisms and potential exposure routes are conceptually simple. Ingestion, dermal contact, and inhalation of surface water and groundwater as well as contact or consumption of biota were not considered as potential exposure pathways in this assessment. Thus, the complete exposure pathways for this risk assessment are confined to direct interaction with the stockpiled soil or inhalation of wind-borne particulates or vapors in all scenarios considered.

5.0 HUMAN HEALTH EXPOSURE ASSESSMENT

This section presents the assessment of potential human exposures to chemicals of potential concern at the site. The exposure assessment was conducted in three major steps according to procedures outlined in the RAGS, Volume I (USEPA, 1989c). In this section, possible future, on-site exposure pathways are identified and evaluated. Exposure point concentrations were derived for each chemical of potential concern in each medium, and potential chemical intakes for human receptors were calculated.

5.1 Identification of Human Health Exposure Pathways

This section will describe the site-specific complete exposure pathways that may impact the persistence and migration of contaminants measured at the site. The subsections include:

- Potential Sources of Exposure;
- Summary of Fate and Transport of Chemical of Concern;
- Exposure Points and Exposure Routes; and
- Complete Exposure Pathways Evaluation.

5.1.1 Potential Sources of Exposure

The potential sources of exposure are ingestion and dermal contact with the soils in the stockpiles contaminated with the seven chemicals of concern. Inhalation exposures to soils or volatilized organic chemicals released from soils are also considered a potential source of exposure for humans and the environment.

5.1.2 Exposure Points and Exposure Routes

The approaches applied to derive chemical exposure point concentrations for the stockpiled soil potentially contacted by human receptors is discussed in this subsection.

The data were separated into two populations: soils at the time of excavation and soils residing in the stockpiles two years after excavation. No further identification of subpopulations or other groupings were considered. This is primarily due to the method by which the samples were collected during the excavation process. These samples were taken primarily to test the concentration of VOCs at the limits of the excavation at various stages. The process was considered somewhat random. The sampling which occurred two years after excavation was conducted systematically using a systematic stratigraphic approach. Pile 1 (see Figure 2, Appendix A) was sampled at its lateral center. Here three samples were collected by dividing the pile into thirds, sampling from the center of each third. A similar approach was taken on Pile 2 where this elongated pile was divided in half laterally and again three samples were collected at the midpoint.

Simple arithmetic means were calculated for both populations for each of the seven constituents (chemicals) of concern. Samples in which the given constituent was not detected (ND) were excluded from the averaging rather than being included as zeros. Samples which contained the constituent below the quantitation limit were included at the stated quantitation limit. The sample standard deviation was also calculated using the sample criteria for including/excluding data. The maximum value used for each constituent was calculated by using the 95 percent confidence interval for a normal distribution. This was accomplished by summing the arithmetic mean with twice the sample standard deviation.

5.1.2.1 Exposure Point Concentrations for Soils

Exposure to soils at the surface of the stockpiles is a plausible occurrence for on-site workers, temporary construction workers, trespassers, on-site future residents and off-site residents. However, the soil pile is currently covered limiting direct exposure to soils to all human receptors or inhalation exposure from a limited wind erosion. Despite covering and security measures, the calculations nevertheless assume a worst case scenario of an accessible, uncovered soil pile.

Exposure point concentrations for soils by ingestion route were calculated directly from analysis of surface soils presented in Tables B-1 and B-2 (Appendix B). Arithmetic average was used for the average exposure scenarios and the average plus two standard deviations was used for the worst case scenarios.

For inhalation of particulates generated from soils with chemicals of concern, exposure point concentrations were evaluated using only the worst case (average plus two standard deviations) concentrations. The model developed by Cowherd (1983) estimates particulate emission rates used for estimating chemical concentrations in particulates from appropriate soil depths (see support data in Appendix D). The resulting emission rates were then used in risk equations of dispersion modeling (USEPA, 1989) to obtain chemical concentrations in soil particulates.

Air particulate concentrations of chemicals of concern are calculated for scenario 1: normal activities (i.e. off-site residents, current and future trespassers, and future on-site workers, assuming 0% continuous vegetative cover and 5 soil disturbances per month); and scenario 2: intrusive activities (i.e. future construction workers, assuming 0% continuous vegetative cover and 23 soil disturbances per month). Concentrations in air with particle size mode of 0.1 mm was used for calculating risks by inhalation of the particulates for the RME scenario because this is the most transportable particle size.

5.2 Quantification of Human Health Exposure

Quantification of exposure in the human health evaluation involves calculation of the estimated chemical intake by receptors in each of the exposure scenarios selected for evaluation. The evaluation of chemical intakes for each exposure scenario is presented in this section.

Exposure equations incorporate rates of contact with contaminated media, duration and frequency of exposure to the contaminated medium, exposure point concentrations of each chemical of potential concern for each medium, and other exposure parameters unique to each exposure scenario in estimated intakes. These equations are in accordance with the RAGS, Volume I (USEPA, 1989c) and OSWER Directive 9285.6-03 (USEPA, 1991a).

For this risk assessment, there are two hypothetical exposure scenarios available to evaluate a range of exposure conditions that may exist for exposed population at the site. The scenarios are:

- Reasonable Average Exposure Scenario (RAE), and
- Reasonable Maximum Exposure (RME) Scenario.

Exposure to a chemical is described in terms of intake, which is expressed in units of milligrams of chemical per kilogram of body weight per day (mg/kg/day). The magnitude of exposure to a chemical (or intake) is a function of a number of variables, including exposure point concentration and variables that describe intake (e.g., contact rate, exposure frequency and duration, and body weight).

The RAE and RME have been estimated using guidance provided in EPA's Risk Assessment Guidance for Superfund (USEPA, 1989a) and supporting guidance documents. The RAE and RME are estimated by selecting intake parameters so that the combination of these variables results in the maximum exposure that can reasonably be expected to occur. The intent of the RME is to estimate a conservative, above-average chemical intake that is still within the range of possible exposure.

5.2.1 Estimating Chemical Intake

The intake can be expressed in the following equation in terms of mg/kg/day:

$$Intake = \frac{chemical\ concentration \times contact\ rate \times exposure\ frequency \times exposure}{body\ weight \times averaging\ time}$$

The units in respect to the above equation are:

$$(mg/kg/day) = \frac{(mg/kg\ or\ mg/l) \times (kg/day\ or\ l/day) \times (days/year) \times (years)}{(kg) \times (days)}$$

The contact rate depends on the exposure route and is equivalent, for example, to the volume of water ingested or air inhaled per day. Exposure frequency and exposure duration are site-specific. Body weight is assumed to be 70 kg for adults. Child body weight is calculated using a time-weighted average. The averaging time, expressed in days, is used to calculate average daily intake. For carcinogenic chemicals, intakes are calculated by averaging the total cumulative dose over an assumed lifetime of 70 years, yielding a lifetime average daily intake. Different averaging times are used for carcinogens and noncarcinogens because it is thought that their effects occur by different mechanisms. The approach for carcinogens is based on the current scientific opinion that a high dose received over a short period of time (as conducted in chronic studies in experimental animals) is equivalent in the dose-response rate to a corresponding low dose spread over a lifetime. Therefore, the intake of a carcinogen, for whatever duration, is averaged over a 70-year lifetime.

5.2.2 Intake Factor Calculations

Omitting the chemical concentration from the intake equation yields an intake factor, which is constant for each exposure pathway and receptor. The general intake factor equation is:

$$Intake\ Factor = \frac{contact\ rate \times exposure\ frequency \times exposure\ duration}{body\ weight \times averaging\ time}$$

The intake factor then can be multiplied by the concentration of each chemical to obtain the pathway-specific intake of that chemical. Intake factors are calculated separately for each potentially exposed receptor and exposure pathway. They were calculated to facilitate the presentation of exposure calculations in the risk characterization section of this report. Supporting documentation for the calculation of intake factors are presented in Appendix D. Appendix D also includes intake factors summary, and detailed calculations of each intake factor for each receptor.

5.2.3 Intake Factor Assumptions

Several exposure parameters, such as exposure duration, body weight, and averaging times have general application in all intake estimations, regardless of pathway. These general exposure assumptions and intake parameters for each human receptor are tabulated in Tables C-1 through C-8 (see Appendix C). In summary, pathway-specific assumptions are described below:

- The average and RME exposure duration for on-site workers were assumed to be 9 and 25 years, respectively (EPA 1991 SDEF). Average occupational exposure duration is equivalent to the 50th percentile duration of residence at one location (EPA 1989 RAGS); reasonable maximum duration is the 95th percentile duration of work at the same location (EPA 1991 SDEF). Under the RME exposure assumption, workers working full time were assumed to be at the area 8 hours per day, 250 days per year (EPA 1991 SDEF) unless site-specific information was provided.

- The averaging time for non-carcinogenic effects is the total number of days over which the exposure occurs. Averaging time for carcinogenic effects is 25,550 days (70 years x 365 days/year) in the RAE and RME cases for all receptors.

- The average adult body weight is 70 kg (EPA 1989d). The average child body weight of 15 kg is used for estimating exposure to children between the ages of 0 to 6 years old. Child (0-6 years), adult (7-30), and a total of 30 years for residential exposure scenario. To evaluate the exposures to chemicals of concern for adults, the exposure duration of 24 years was used.

5.3 Uncertainties in the Human Health Exposure Assessment

Uncertainties in the human health exposure assessment for the CMW facility are discussed in this risk section which includes some discussion of their impact on the overall risk assessment. Table C-9 (Appendix C) summarizes uncertainty analysis associated with sampling, exposure assessment, and risk characterization.

5.3.1 Uncertainties Analysis

The risk assessment uses assumptions to estimate the potential human risks. Assumptions are not precise predictions of exposures and contain different degrees of uncertainties. The uncertainties are analyzed and summarized in Table C-9 (Appendix C). For convenience, they are analyzed by the following categories of assumptions:

- Sampling and analysis impacts;
- Estimation of exposure; and
- Use of conservative toxicity values.

5.3.2 Reduction in Chemical Concentration by Degradation

When a point concentration is estimated for each medium, degradation occurs over time by heat, UV radiation, and by microorganisms in soils, sediments and surface water. These degradation processes were ignored. Most chemicals have certain half-lives in air, water, and in sediments. When risks are estimated for a lifetime of 30 years, it is likely overestimated.

It was observed that the arithmetic averages of the samples collected in the stockpiles two years after excavation are lower than during excavation. Although soil contaminant inhomogeniety, differences in laboratory technique, and sampling bias are undoubtedly major contributing factors, overall contaminant reduction due to volatilization and degradation is theoretically a reasonable assumption.

6.0 HUMAN HEALTH TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to evaluate the toxicity of the seven soil pile-related chemicals of concern and to identify an estimate of the dose-response relationship for each of these chemicals. The information obtained in the toxicity assessment is combined with estimated chemical intakes calculated as part of the exposure assessment to estimate the potential excess lifetime cancer risks and potential noncarcinogenic health hazards.

Noncarcinogenic responses are generally characterized by a threshold: a certain minimum intake of substance below which the likelihood of adverse deleterious effects is expected to be low. A threshold effect can be best described as a non-graded response. That is, exposure to a range of chemical concentrations that can be tolerated by an organism with essentially no change of expression of adverse effects until protective mechanisms of the organism are overwhelmed. Carcinogenic responses are assumed to have no threshold. This assumption means that there is some finite cancer risk no matter how small the dose.

The two principal indexes of toxicity are the reference dose (RfD) and slope factor (SF). These values are derived by the EPA for the most commonly occurring chemicals and the most toxic chemicals generally associated with chemical releases to the environment for which adequate scientific dose-response data are available. An RfD is the intake or dose per unit of body weight per day (mg/kg/day) that is unlikely to result in toxic effects to human populations, including sensitive subgroups (e.g., the very young or old). The RfD allows for the existence of a threshold dose and is used for the assessment of potential noncarcinogenic effects.

The SF is used to estimate an upper-bound probability of an individual developing cancer as a result of exposure to a potential carcinogen. Carcinogens with EPA-derived slope factors are also given an EPA weight-of-evidence classification whereby potential carcinogens are grouped depending on the quality and quantity of carcinogenic potency data for a given chemical. Available RfDs and Sfs for each chemical of concern are presented in Table C-10 (Appendix C). These RfD and SF values used in this risk assessment were obtained from the following sources:

- EPA's Integrated Risk Information System on-line database system; and
- EPA's Health Effects Assessment Summary Tables (USEPA, 1992).

6.1 Toxicity Assessment for Noncarcinogenic Effects

There are three chemicals of concern in the soil piles which are classified as non-carcinogens. These three chemicals are 1,1-dichloroethane (1,1-DCA), 1,1,1-trichloroethane (1,1,1-TCA), and total 1,2-dichloroethene (1,2-DCE).

Substances that produce noncarcinogenic effects are generally thought to have a threshold dose below which there are no observable adverse health effects. In developing a toxicity value for noncarcinogenic effects, the approach is to identify this threshold dose or no-observed-adverse-effect level (NOAEL) through studies with experimental animals. A NOEAEL can be obtained from human epidemiology studies or from an experimentally determined highest dose at which there was no statistically or biologically significant effect of concern, often called the "critical toxic effect." For certain substances, only a LOAEL, or "lowest-observed-adverse-effect level," has been determined. This is the lowest dose of a substance that produces either a statistically or biologically significant indication of the critical toxic effect. The NOAEL or the LOAEL may be used to calculate the RfD of a particular chemical.

When human epidemiological data are available, RfDs can be determined directly from the relevant studies using modifying factor of 1 - 10 depending on the quality of the study. For most chemicals, RfDs are generally calculated by dividing the NOAEL (or LOAEL) from animal studies by uncertainty factors, which generally range from 10 to 1000. In some cases, the uncertainty factor of 3,000 can be used. For example, uncertainties include variations in the sensitivity of individuals within a population and the extrapolation of data from experimental animals to humans. The RfD is expressed in units of milligrams of chemical per kilogram of body weight per day (mg/kg/day) for oral exposure and in milligrams of chemical per cubic meter of air per day (mg/m^3) for inhalation exposure. A body weight of 70 kg and a respiration rate of 20 m^3/day are generally used to convert the reference air concentration (mg/m^3) to a dose (i.e., mg/kg/day). The methodology for deriving RfDs is more fully described in the EPA's current human health risk assessment guidance (EPA 1989).

The majority of our toxicological knowledge of chemicals comes from experiments with laboratory animals. Experimental animal data have historically been relied upon by regulatory agencies and other expert groups to assess the hazards of human chemical exposures. Although this reliance has been generally supported by empirical observations, there are known interspecies differences in chemical absorption, metabolism, excretion, and toxic responses. There are also uncertainties concerning the relevance of aminal studies using exposure routes that differ from the human exposure routes under consideration. Additionally, the extrapolation of results of short-term or subchronic animal studies to long-term expsures in humans has inherent uncertainty.

Despite the many limitations of experimental data, such information is essential for chemical toxicity assessment, especially in the absence of human epidemiological evidence. The uncertainty factors used in the derivation of RfDs are intended to compensate for data limitations and any synergistic effects. Synergistic effects may occur when a combination of chemicals has a greater than additive effect. This approach is conservative by design and is meant to avoid the underestimation of protective RfD values.

The EPA has developed various types of RfDs depending on the exposure route (ingestion or inhalation), the critical effect, and the length of exposure being evaluated (chronic or subchronic). The EPA bases the RfD on the most sensitive animal species tested (i.e., the species that experiences adverse effects at the lowest dose).

EPA defines a chronic RfD as an estimate of a daily exposure level for the human population that is unlikely to result in deleterious effects during a lifetime (i.e., 70 years, according to EPA guidance). A chronic RfD is used to evaluate the potential noncarcinogenic hazards associated with long-term chemical exposures (7 years to a lifetime).

Subchronic RfDs have been developed to characterize potential noncarcinogenic hazards associated with short-term chemical exposures. The EPA defines subchronic exposure as periods ranging from 2 weeks to 7 years (EPA 1989). Subchronic RfDs tend to be higher, generally by an order of magnitude, than chronic RfDs because of the shorter exposure duration.

Chronic and subchronic RfDs for the chemicals of concern are shown in Table C-10 (see Appendix C). For the ingestion route, the RfD is for the administered dose (assuming 100 percent absorption by the gastrointestinal tract) unless otherwise noted. For the inhalation route, 100 percent of a chemical that is inhaled and retained by the lungs was assumed to be absorbed into the bloodstream unless otherwise noted. Both assumptions enhance the conservatism of the risk assessment. RfDs have also be developed from many of the carcinogens to account for their noncarcinogenic effects. RfDs have not been developed for the dermal route of exposure. Oral RfDs can be modified to derive a RfD suitable for use in assessing dermal exposures by replacing the oral absorption factor shown (ABS) in the following equation:

$$\text{Administered Oral RfD} \times \text{ABS (unitless)} = \text{Absorbed Dermal RfD}$$

The application of an appropriate dermal absorption factor to the administered RfD provides the absorbed dermal RfD.

6.2 Toxicity Assessment for Carcinogenic Effects

There are four chemicals of concern in the soil piles which are classified as known or suspected carcinogens. These chemicals are trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), tetrachloroethene (PCE), and chloroform.

In estimating the potential risk posed by potential carcinogens, it is the common practice of the EPA and other regulatory agencies to assume that any exposure level is associated with a finite probability, however minute, of producing a carcinogenic response. EPA assumes that a small number of molecular events can evoke changes in a single cell that can lead to uncontrolled cellular proliferation. This mechanism for carcinogenicity is referred to as "non-threshold" since there is theoretically no level of exposure for such a substance that does not pose a small, though finite, probability of producing a carcinogenic response. The EPA uses an evaluation process in which the substance is assigned a weight-of-evidence classification. This describes the likelihood, based on scientific evidence, that the substance is a human carcinogen. A slope factor is then calculated that defines quantitatively the relationship between average lifetime dose and carcinogenic risk.

The slope factors are based primarily upon the results of animal studies. There is uncertainty whether animal carcinogens are also carcinogenic in humans. While many chemical substances are carcinogenic in one or more animal species, only a small number of chemical substances are known to be human carcinogens. The EPA assumes that humans are as sensitive to all animal carcinogens as the most sensitive animal species. This policy decision is designed to prevent underestimating risk, and introduces the potential to overestimate but not to underestimate carcinogenic risk.

A number of mathematical models and procedures have been developed to extrapolate from carcinogenic responses observed at high doses in experimental animals to responses expected at low doses in humans. A linearized multistage model is one of the most commonly used model by EPA for low-dose extrapolation. This conservative mathematical model is based on the multi-stage theory of carcinogenesis wherein the response is assumed to be linear at low doses. The EPA further calculates the upper 95th% confidence limit of the slope of the resulting dose-response curve. This value, the slope factor (SF), expressed in units of $(mg/kg/day)^{-1}$, is used to convert the average daily intake of chemical, normalized over a lifetime, directly to a cancer risk. This represents an estimation of an upper-bound incremental lifetime probability that an individual will develop cancer as a result of exposure to a potential carcinogen. This model provides a conservative estimate of cancer risk at low doses, and is likely to overestimate the actual cancer risk. The EPA acknowledges that actual slope factors are likely to be between zero and the estimate provided by the linearized multistage model (USEPA, 1989b). The slope factors and weight-of-evidence classifications for the four known or suspected carcinogens in the soil piles are also included in Table C-10 (Appendix C).

These slope factors were developed by EPA and are available on the Integrated Risk Information System (IRIS) database. It is assumed by EPA in developing Sfs that the risk of cancer is linearly related to dose. Risks associated with the four known or suspected carcinogens (discussed above) can be derived by multiplying the SF and the estimated lifetime average daily intake for each exposure pathway as follows:

$$\underset{(unitless)}{Risk\ Estimate} = \underset{(mg/kg/day)}{[Average\ Daily\ Intake]} \times \underset{(mg/kg/day)^{-1}}{[Slope\ Factor]}$$

An overall risk estimate for each exposure scenario can be calculated by combining individual chemicals and exposure routes. Risk estimates are then compared with EPA's acceptable risk range of 10^{-4} (1/10, 000) to 10^{-6} (1/1,000,000) risk. EPA has indicated that risks more than 10^{-4} require remediation.

6.3 Toxicity Summary of Chemicals of Concern

Generally, chemicals with high SFs and low RfDs exhibit higher toxicities. Table C-10 summarizes the slope factors and reference dosages used in this risk assessment for the seven chemicals of concern. A summary of the toxicological properties associated with each of these chemicals is found in Appendix E.

6.4 Uncertainties Related to Human Health Toxicity Information

Toxicity information for many chemicals is often limited. This section will present and evaluate uncertainties in available toxicity information and discuss the impact of such uncertainties on the final risk characterization. An understanding of the degree of uncertainty associated with toxicity values is an important part of interpreting toxicity values such as RfDs and SFs.

6.4.1 Uncertainties

EPA derives toxicity values for RfDs and SFs conservative enough to protect sensitive human populations. Some RfDs and SFs are derived directly from the human epidemiological data, but most chemical RfDs are obtained by applying modifying and uncertainty factors to a no-observed-adverse-effect level (NOAEL) from the animal data. When a NOAEL is not available, the lowest-observed-adverse-effect level (LOAEL) is used in the place of NOAEL with an additional uncertainty factor of 10. When human data are available, uncertainty factors are between 3 to 10 based on the quality of study conducted.

Slope factors (SFs) are derived using the linearized multi-stage model (LMS) or other available models. The LMS extrapolates a 95% upper confidence limit on the dose response curve. The LMS is a very conservative model and therefore potential risks may be overestimated.

Another area of large uncertainties is the difference in administered dose and absorbed dose. When the animals were dosed with a chemical, the dose applied was not necessarily an absorbed dose. The rate and degree of absorption are largely depended on the physical and chemical properties of chemicals. The assumption of 100% absorption from the gastrointestinal tract (GI) is very conservative. In general, acidic chemicals are more readily absorbed from a stomach, while basic chemicals are more absorbed from the small intestines.

When a chemical is bound to a soil matrix, there is a reduction in the absorption of the chemical by the GI tract. The use of 100% absorption by ingestion of soils with the seven chemicals of concern will overestimate the risks associated with the site.

7.0 HUMAN HEALTH RISK CHARACTERIZATION

This section presents the human health risk characterization for the stockpiled soils at the CMW facility. Risk characterization is the final step of the risk assessment process. In this step, the toxicity and exposure assessment are summarized and integrated into quantitative and qualitative expressions of risk. The steps include:

1. Organize outputs of exposure and toxicity assessments:
   - Exposure duration
   - Absorption adjustment
   - Consistency check
2. Quantify pathway risks for each substance and estimate:
   - Cancer risk
   - Noncancer hazard quotient
   - Total cancer risk
   - Noncancer hazard index
3. Combine risks across pathways that affect the same individuals over the same time periods:
   - Sum cancer risks
   - Sum hazard indices
4. Assess and present uncertainty:
   - Site-specific factors
   - Toxicity assessment factors
5. Summarize results of baseline risk assessment

There are two separate discussions, one for noncarcinogens and the other for carcinogens, because the methodology differs for these two modes of chemical toxicity.

7.1 Noncarcinogens

The potential for noncarcinogenic effects were evaluated by comparing the exposure level, or chemical daily intake, over a specified time period (e.g., acute, subacute, or chronic) with a reference dose (RfD) derived for a similar exposure period. A Hazard Quotient (HQ) is derived for each specific chemical as follows:

$$\text{HQ (unitless)} = [\text{Average Daily Intake}]\ (\text{mg/kg/day}) \ / \ [\text{RfD}]\ (\text{mg/kg/day})$$

If exposure is equivalent to or less than the RfD, the HQ should be 1.0 or less, which represents an intake level unlikely to be associated with potential adverse effect due to the contaminant. If exposure exceeds the RfD, the resulting HQ will exceed 1.0 and it should be concluded that a hazard may exist. For each noncarcinogenic chemical of concern specific to each exposure pathway, an HQ will be derived. HQs for each chemical are then summed for each exposure pathway to derive a value referred to as a Hazard Index (HI):

$$\text{HI (unitless)} = HQ_1 + HQ_2 + HQ_3 \ldots\ldots\ldots\ldots + HQ_n$$

Exposure pathway hazard indices are summed across pathways whenever possible since individuals may be simultaneously exposed to contaminants via more than one pathway (e.g., to both soil and groundwater). Hazard indices greater than 1.0 should generally be viewed as indicating that exposure to a particular medium identified in the exposure scenario may represent a human health hazard.

7.2 Carcinogens

The toxicity descriptors that can potentially cause carcinogenic effects in humans are called Slope Factors (SFs). These SFs have been developed by EPA and are available on the IRIS data base. It is assumed by EPA in developing SFs that the risk of cancer is linearly related to dose. Risks associated with carcinogens can be derived by multiplying the SF and the estimated lifetime average daily intake for each exposure pathway as follows:

$$\underset{(unitless)}{\textit{Risk Estimate}} = \underset{(mg/kg/day)}{[\textit{Average Daily Intake}]} \times \underset{(mg/kg/day)^{-1}}{[\textit{Slope Factor}]}$$

An overall risk estimate for each exposure scenario can be calculated by combining individual chemicals and exposure routes. Risk estimates are then compared with EPA's acceptable risk range of 10^{-4} (1/10,000) to 10^{-6} (1/1,000,000) risk. EPA has stated in the memorandum for Superfund Remedy Selection Decisions that "Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts" (USEPA, 1991b).

7.3 Summary of Carcinogenic and Noncarcinogenic Risks by Scenario

This section summarizes each exposure scenario evaluated for carcinogenic and noncarcinogenic risks. Table D-1 (Appendix D) summarizes cancer risks for all the human receptors. The remaining tables in Appendix D include a human receptor/pathway summary, soil chemical concentrations used for calculations, and results of carcinogenic risk calculations.

This risk assessment has assumed the worst case scenario by calculating the risk for future on-site residents, current and future trespassers, off-site residents, future construction workers and on-site workers. It has also been assumed that no natural attenuation of the existing levels of any of the seven constituents of concern will occur.

8.0 SUMMARY OF HUMAN RISK EVALUATION

The overall objective of this risk assessment is to identify chemical risks associated with the two excavated soil piles at CMW, Inc., and to describe how those chemicals may have an effect on human health. Seven chemicals of concern were identified in the soil piles; four of them being known or suspected carcinogens, with the remaining three classified as noncarcinogenic.

The exposure pathways of this impacted soil are limited. The site is located in a mixed manufacturing, commercial and residential area. The area is also on piped city water. The site is completely fenced and well secured, so direct access to the covered contaminated soil piles is limited.

The risk for the seven chemicals of concern was quantified by using both Reasonable Average Exposure (RAE) and Reasonable Maximum Exposure (RME) scenarios for ingestion and dermal contact routes of exposure. Only the worst case was evaluated for inhalation. The focus was to provide a risk estimate that is the most conservative as reasonably possible for the site.

Not all possible exposure scenarios were evaluated. Those with the potential to impose the greatest level of risk were selected for quantification. The following exposure pathways were evaluated:

- Ingestion of soils with chemicals of concern;
- Dermal contact of soils with chemicals of concern; and
- Inhalation of particulates or volatilized chemicals from the soil piles exposed to wind erosion.

For all scenarios it was assumed that no further natural attenuation of the constituents would occur.

Receptors were selected on the same conservative basis. The following scenarios were evaluated:

- Hypothetical Future Residents - Both Adult and Children
- Future Construction Workers
- Future On-Site Industrial Workers
- Current and Future Trespassers - Both Adult and Children
- Current Off-Site Residents Who May Be Exposed To Chemicals of Concern Via Inhalation of Airborne Particulates or Volatilized Chemicals From the Soils

The USEPA has designated risk levels that are deemed acceptable for noncarcinogenic and carcinogenic chemicals. For noncarcinogens, hazard indices less than 1.0 should generally be viewed as indicating that exposure to a particular medium identified in the exposure scenario (i.e., the soil piles) may not represent a human health hazard. For carcinogens, carcinogenic risks less than $1x10^{-6}$ are considered nonconsequential. Carcinogenic risk as great as $1x10^{-4}$ can be considered acceptable, particularly in an industrial setting (USEPA, 1991c and 1991d).

Table D-1 (Appendix D) tabulates a summary of the quantitative results of this risk assessment. For the RAE, the impacted soil poses no risk greater than $2x10^{8}$ and the RME no greater than $6x10^{-7}$, irrespective of exposure scenario. There essentially is no hazard related to toxological effects (HI<0.00001).

Based on the evaluation, the greatest potential risk was for the hypothetical on-site residents with ingestion and dermal exposure to the soil. Even under these most unlikely conditions and worst case assumptions, no cumulative risk was greater than $7x10^{-7}$. Here, risk calculation was based on a future on-site resident child through dermal contact, ingestion, and inhalation with the maximum[1] concentration as measured during excavation.

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[1]Average plus two standard deviations

Most of the risk values calculated for the assumed receptor exposures fall between 10^{-8} to 10^{-11}, far below the 10^{-6} lower limit used by the USEPA. In addition, none of the health risks for future industrial workers was determined to be of any significance even under the most conservative exposure condition. There are not currently, nor are there ever anticipated to be, any on-site residents at this facility.

This risk assessment was predicated on the most conservative assumptions. Given that the most extreme scenario with maximum concentration yields a cumulative risk of cancer less than 10^{-6}, it appears that the stockpiled soil should not be considered hazardous to humans. Moreover, based on the soil organic concentrations determined from the data collected during excavation, the soil was never hazardous to human health under even the most conservative exposure/receptor scenarios.

9.0 REFERENCES

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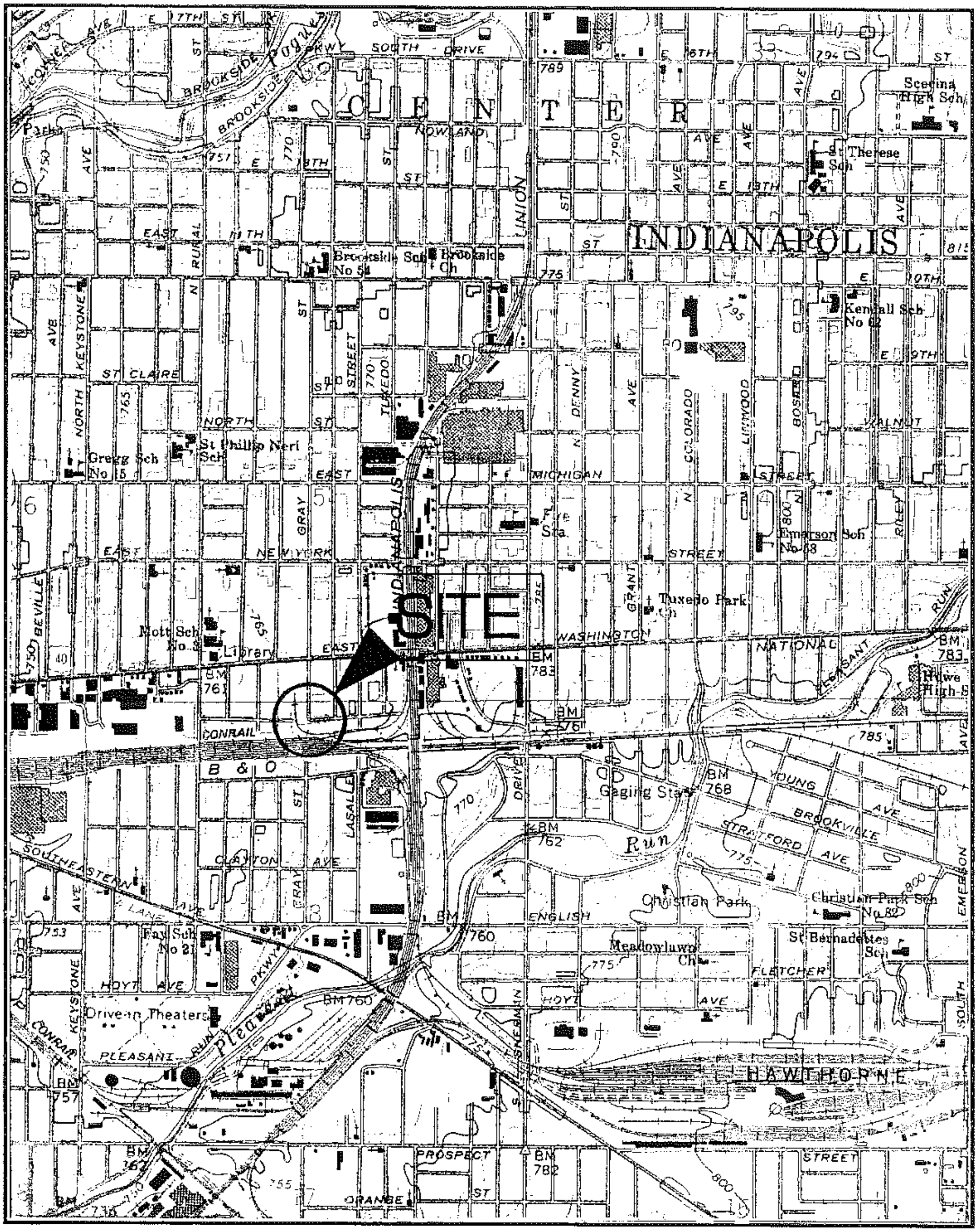
USEPA, 1991d, Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions Office of Solid Waste and Emergency Response. OSWER Directive 9355.0-30

USEPA, April, 1992, Guidelines for Exposure Assessment EPA Exposure Assessment Group, Risk Assessment Forum, Washington, D.C. (Also filed is FR Notice Of May 29, 1992)

APPENDIX A

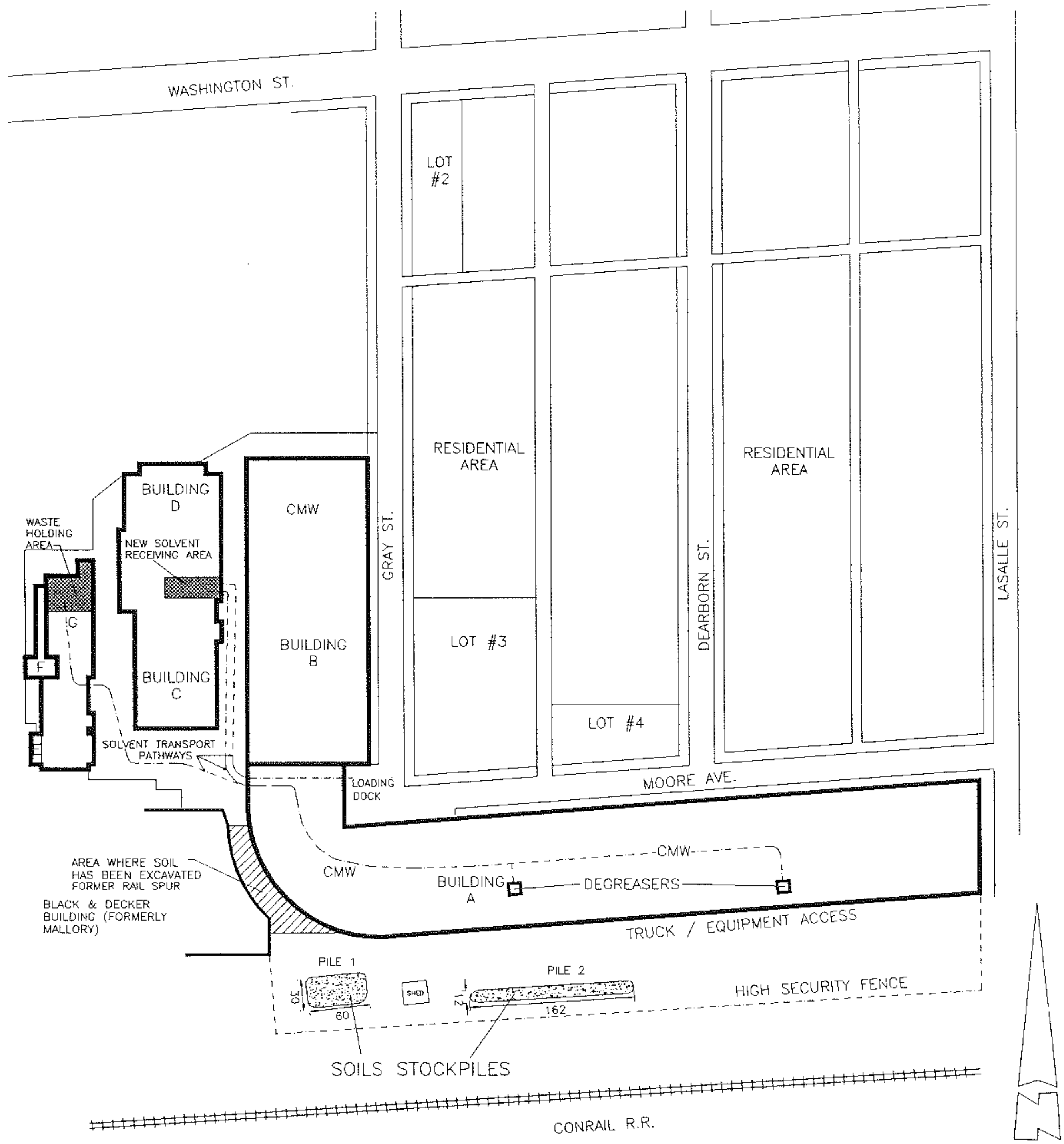
FIGURES 1 AND 2



SITE VICINITY MAP
CMW, INC.
INDIANAPOLIS, IN

PROJECT NO.	11-07-93-00040
SCALE	1" = 2000'
FIGURE NO.	1

ATEC



SITE LAYOUT MAP
CMW, INC.
INDIANAPOLIS, IN

PROJECT NO.	11-07-93-00040
SCALE	1" = 150'
FIGURE NO.	2

ATEC

APPENDIX B

ANALYTICAL RESULTS FOR SAMPLING OF SOIL DURING EXCAVATION AND IN STOCKPILES

TABLE B-1: ANALYTICAL DATA ON STOCKPILED SOIL, TESTED 9/91
CONCENTRATION IN MICROGRAMS PER KILOGRAM (ug/kg)

Sample Identification	CHLFM	1,1-DCA	1,1-DCE	1,2-DCE	PCE	1,1,1-TCA	TCE
P1-A	12	23	ND	54	41	76	290
P1-B	14	19	dbql (5)	65	66	200	410
P1-C	81	38	dbql (5)	190	160	350	1600
P2E-A	ND	ND	ND	ND	dbql (5)	dbql (5)	6
P2E-B	ND	dbql (5)	ND	dbql (5)	9	28	75
P2E-C	dbql (5)	5	ND	6	12	60	110
P2W-A	ND	ND	ND	ND	dbql (5)	dbql (5)	6
P2W-B	ND	ND	ND	dbql (5)	dbql (5)	160	71
P2W-C	ND	ND	ND	dbql (5)	dbql (5)	96	67

STATISTICAL SUMMARY FOR STOCKPILED SOIL (ug/kg)

PARAMETER	CHLFM	1,1-DCA	1,1-DCE	1,2-DCE	PCE	1,1,1-TCA	TCE
Number Detected	4	5	2	7	9	9	9
Percent Detected	44.4%	55.6%	22.2%	77.8%	100.0%	100.0%	100.0%
Average Value	28	18	5	47	34	109	293
Maximum Value	81	38	5	190	160	350	1600
Minimum Value	5	5	5	5	5	5	6
StaNDard Deviation	31	12	0	63	49	106	479
Average + 2 Std Dev	90	43	5	173	132	321	1251

dbql (5) - detected below quantitation limit - assigned value of QL for statistical purposes; ND - not detected
Statistics calculated excluding samples for which the analytical parameter was not detected, but included all dbql values.

P1=Pile 1; P2E=Pile 2, East; P2W=Pile 2, West (See Figure 2 for Pile Locations)
Relative Sampling Depth in Stockpiles: A=Upper Third; B=Middle Third; C=Lower Third

Abbreviations

Chloroform	CHLFM
1,1-Dichloroethane	1,1-DCA
1,1-Dichloroethene	1,1-DCE
Total-1,2-Dichloroethene	1,2-DCE
Tetrachloroethene	PCE
1,1,1-Trichloroethane	1,1,1-TCA
Trichloroethene	TCE

TABLE B-2: ANALYTICAL DATA ON SOIL AS EXCAVATED, 1989
CONCENTRATION IN MICROGRAMS PER KILOGRAM (ug/kg)

Sample Identification	CHLFM	1,1-DCA	1,1-DCE	1,2-DCE	PCE	1,1,1-TCA	TCE
BH4-A	ND	ND	ND	ND	39	ND	96
BH4-B	630	260	180	4900	2200	5000	48000
BH4-C	71	59	75	1300	250	510	2400
EX-1A	ND	150	ND	ND	ND	ND	ND
EX-1B	ND	210	ND	ND	ND	ND	ND
EX-1.5A	ND	ND	ND	ND	ND	ND	ND
EX-1.5B	ND	55	ND	ND	ND	53	ND
EX-2A	ND	ND	ND	ND	ND	ND	ND
EX-2B	ND	ND	ND	ND	ND	15	ND
EX-2.5A	ND	ND	ND	ND	ND	15	ND
EX-2.5B	ND	ND	ND	ND	ND	12	ND
EX-3A	ND	ND	ND	ND	ND	ND	ND
EX-3B	ND	220	ND	ND	ND	ND	ND
EX-4A	ND	ND	ND	ND	ND	6	6
EX-4B	ND	16	ND	18	ND	50	22
EX-CENTER-AE	ND	12	ND	ND	ND	ND	ND
EX-CENTER-AW	ND	ND	ND	ND	ND	ND	ND
EX-CENTER-BE	ND	ND	ND	ND	ND	ND	ND
EX-CENTER-BW	ND	ND	ND	ND	ND	ND	ND
STOCK PILE C	ND	38	22	12	11	620	57
STOCK PILE E	23	19	7	45	24	180	430
STOCK PILE W	ND	ND	ND	6	ND	38	45
WALL-2E	ND	36	20	36	ND	1400	540
WALL-2W	ND	21	ND	13	ND	450	140
WALL-3E	ND	230	ND	82	ND	340	95
WALL-3W	ND	17	ND	ND	ND	ND	ND
NW-CORNER	ND	54	ND	ND	ND	ND	ND
S2-A	ND	12	ND	ND	ND	38	21
S3-A	ND	44	12	ND	ND	290	35
S4-A	ND	ND	ND	ND	ND	7	6
S5-A	ND	11	ND	ND	ND	75	33
S6-A	ND	ND	ND	ND	7	96	99

STATISTICAL SUMMARY FOR EXCAVATED SOIL (ug/kg)

PARAMETER	CHLFM	1,1-DCA	1,1-DCE	1,2-DCE	PCE	1,1,1-TCA	TCE
Number Detected above QL	3	18	6	9	6	19	16
Percent Detected	9.4%	56.3%	18.8%	28.1%	18.8%	59.4%	50.0%
Average Value	241	81	53	712	422	484	3252
Maximum Value	630	260	180	4900	2200	5000	48000
Minimum Value	23	11	7	6	7	6	6
Standard Deviation	276	86	61	1533	800	1115	11568
Average + 2std	792	253	175	3778	2021	2714	26388

ND - Not Detected above Quantitation Limit. Samples detected below QL were called ND in this population.

Statistics included only values detected above Quantitation Limit.

Samples were collected as follows: 1) BH-4 was a pre-excavation hand-auger boring in the "hottest" area; 2) samples starting with "EX", "WALL", "S", and sample NW-CORNER were taken at various locations within the excavation pit; and 3) samples starting with "STOCK PILE" were taken immediately after excavation from the center, east end, and west end of Pile 1.

APPENDIX C

BASELINE ASSUMPTIONS - TOXICOLOGY INFORMATION AND REQUIRED DATA MODIFICATION FACTORS

TABLE C-1

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Future Hypothetical On-Site Adult Residents

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Chemical concentration in surface water and groundwater (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual",(RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in soils and sediments (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	RAGS 12/89.
Groundwater Ingestion rate (IR)	1.4 liters/day	2 liters/day	Recommended groundwater ingestion rate - (RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represents mean and reasonable maximum exposure concentrations. Air concentrations as soil particles and volatilized chemical concentrations in groundwater during showering are estimated from screening level model and presented in Appendix.
Soil and sediment ingestion rate (IR)	10 mg/day	100 mg/day	RME value is from EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is from Exposure Factors Handbook (EFH), 3/90.
Inhalation rate (IR) for soil particles and VOCs in air from soils	0.83 m3/hr	1.05 m3/hr	Average rate was calculated from a daily inhalation rate of 20 m3/day divided by 24, and RME value was calculated from a daily inhalation rate of 25 m3/day divided by 24. EPA Exposure Factors Handbook, EPA/600/8-89/043, 3/90.
Inhalation rate (IR) (for showering)	0.6 m^3/hr	0.6 m^3/hr	Recommended inhalation rate during showering (RAGS, 12/89).
Surface water ingestion rate (IR)	25 ml/day	50 ml/day	RME is from RAGS, 12/89 and RAE value is a half of the RME.
Skin surface area (SA) (for showering)	20,000 cm^2	23,000 cm^2	19,400 m2 is a 50th percentile adult male body surface area (RAGS 12/89). Total skin surface values used for the calculations were selected from EPA's "Dermal Exposure Assessment: Principles and Application ". EPA/600/8-091/011B, 1/92.
Skin surface area (SA) (for surface water, soil, and sediment dermal contacts)	5,000 cm^2	5,800 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. 5,000 cm2 is a 25% of the total body surface area for RAE (20,000 cm2) and 5,800 cm2 is a 25% of the total body surface area for RME listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.

TABLE C-1 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Future Hypothetical On-Site Adult Residents

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Exposure time (ET) for outdoor inhalation	2 hr/day	4 hr/day	Both the average and reasonable maximum exposure times are conservative estimates of the amount of time an adult resident spend on the site each day regardless of weather condition.
Exposure time (ET) for surface water dermal contact	1 hr/day	2 hr/day	Both RAE and RME values are conservative estimates of the amount of time an adult resident comes to contact with surface water.
Exposure frequency (EF)	275 days/year	350 days/year	RME is from EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is a 2/3 of RME value.
Exposure duration (ED)	9 year	30 year	Mean and national upper bound time at one residence (RAGS 12/89). 30 yr exposure duration was used since an adult and a child residential exposures were evaluated separately. 6 years (0-6 years) and 30 years (7-adult).
Dermal permeability constant (PC)	Chemical-specific	Chemical-specific	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Applications'. EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in Tables.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals and 0.1% (0.001) for inorganic chemicals were recommended in the document.
Fraction Contaminated (FI)	0.5 for soils, sediments surface water and groundwater	1.0 for soils, sediments, surface water and groundwater	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	70 kg	70 kg	Conventional adult body weight (RAGS, 12/89)

TABLE C-1 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Future Hypothetical On-Site Adult Residents

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89)

TABLE C-2

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Future Hypothetical On-Site Child Residents

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Chemical concentration in surface water and groundwater (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual", (RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in soils and sediments (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	RAGS 12/89.
Groundwater ingestion rate (IR)	1.0 liters/day	1.5 liters/day	Values were from EPA's "Exposure Factors Handbook " (EFH, EPA/600/8-89/043,7/89). There are several different drinking water intake rates available in the document: 1 liter/day for children under 10 kg; 0.9 liter/day for 2 year old; 1.5 liter/day for children between 14-16 years; an average of 0.76 liter/day for children 0 to 9; and a range of 1-1.7 liter/day for children 5-14 years. A value of 1 liter/day for RAE is reasonable for children age 0-6 in this exposure scenario, and is consistent with the ranges cited in the guidance. The RME value of 1.5 liter/day was used because the document also cited a range of water consumption of 1-1.7 liter/day for children 5-14 years.
Surface water ingestion rate (IR)	25 ml/day	50 ml/day	RME is from RAGS 12/89, and RAE value is a half of RME.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represents mean and reasonable maximum exposure concentration. Chemical concentrations from soil particles and from volatilized chemicals in groundwater are estimated from screening level models and presented in Appendix.
Soil and sediment ingestion rate (IR)	100 mg/day	200 mg/day	Recommended ingestion rate for children, RAGS, 12/89.
Inhalation rate (IR) for soil particles and VOCs in air from soils	0.4 m3/hr	0.8 m3/hr	Average rate was calculated from a daily inhalation rate of 20 m3/day divided by 24, and RME value was calculated from a daily inhalation rate of 25 m3/day divided by 24. EPA Exposure Factors Handbook, EPA/600/8-89/043, 3/90.
Inhalation rate (IR) (for showering)	0.6 m3/hr	0.6 m3/hr	Recommended inhalation rate during showering (RAGS, 12/89).
Skin surface area (SA) (for showering)	7,930 cm^2	9,180 cm^2	Total skin surface values used for the calculations were selected from EPA's "Dermal Exposure Assessment: Principles and Application s" EPA/600/8-091/011B, 1/92. 7,930 cm^2 is a 50th percentile of total body surface area of male children at age 5-6 years old. 9,180 cm^2 is a 95th percentile for total body surface area of male children age 5-6 years from the same Table 8-4.

TABLE C-2 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Future On-Site Child Residents

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Skin surface area (SA) (for surface water, soil, and sediment dermal contacts)	1,250 cm^2	1,450 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. 1.250 cm^2 is a 25% of the total body surface area for RAE (7,930 cm^2) and 1.450 cm^2 is a 25% of the total body surface area for RME (9,180 cm^2) listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.
Exposure time (ET) for surface water and sediment dermal contact	1 hr/day	2 hr/day	Both RAE and RME values are conservative estimates of exposure time to soils and sediments.
Exposure Time (ET) for outdoor inhalation	2 hr/day	4 hr/day	Both the average and reasonable maximum exposure times are conservative estimates of the amount of time an child resident spend on the site each day regardless of weather condition.
Exposure frequency (EF) for incidental ingestion and dermal contact of soils and sediments	26 days/year	52 days/year	RME value is derived assuming exposures occur once a week and RAE value is 1/2 of the RME value.
Exposure frequency (EF) for showering	275 days/year	350 days/year	RME is from EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is a 2/3 of RME value.
Exposure duration (ED)	6 year	6 year	A child exposure is 6 years (0-6 years) , RAGS, 12/89.
Dermal permeability constant (PC)	Chemical-specific	Chemical-specific	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in tables.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals and 0.1% (0.001) for inorganic chemicals were recommended in the document.

TABLE C-2 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Future On-Site Child Residents

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Fraction Contaminated (FI)	0.5 for soils, sediments, groundwater and surface water	1.0 for soils, sediments, groundwater and surface water	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Exposure time (ET) (for showering)	7 min/day (0.12 hr/day)	12 min/day (0.2 hr/day)	50th and 95th percentile amount of time for shower (RAGS 12/89).
Exposure frequency (EF)	275 days/year	350 days/year	"Standard Default Exposure Factors" (SDEF), OSWER Directive 9285.6-03 (3/25/91).
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	15 kg	15 kg	Conventional adult body weight (RAGS, 12/89)
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89)

Note: *1 RAE= Reasonable Average Exposure
*2 RME= Reasonable Maximum Exposure

TABLE C-3

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Future On-Site Construction Workers

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Chemical concentration in surface water (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual", (RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in soils and sediments (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	RAGS 12/89.
Surface water ingestion rate (IR)	25 ml/day	50 ml/day	RME is from RAGS 12/89, and RAE is a half of the RME value.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represents mean and reasonable maximum exposure concentration. Chemical concentrations in air as soil particles and volatilized chemicals from groundwater during showering are estimated by screening level models and presented in Appendix.
Soil and sediment ingestion rate (IR)	50 mg/day	100 mg/day	RME value EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is 1/2 of the RME value.
Inhalation rate (IR) for soil particles and VOCs in air from soils	0.83 m3/hr	2.5 m3/hr	Inhalation rate for RME is from 20 m3/8 hour workday = 2.5 m3/hr. Inhalation rate for RAE is 1/3 of 8-hour workday.
Skin surface area (SA) (for surface water, soil, and sediment dermal contacts)	5,000 cm^2	5,800 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. 5,000 cm2 is a 25% of the total body surface area for RAE (20,000 cm2) and 5,800 cm2 is a 25% of the total body surface area for RME listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.
Exposure frequency (EF) for surface water and sediments	26 days/year	52 days/year	RME value assumes that these exposure occur once a week and RAE is a half of the RME value.
Exposure frequency (EF) for outdoor inhalation	60 days/year	130 days/year	RAE value is 5 days/week for 3 month of construction works on the site, and RME value is 5 days/week for 6 month of construction works.
Exposure time (ET) for surface water dermal contact	1 hr/day	2 hr/day	Both RAE and RME values are conservative estimates of the time that construction workers may have contact with surface water.
Exposure Time (ET) for outdoor inhalation	4 hr/day	8 hr/day	RME value is from 8 hr/day working hours, and RAE value is 1/2 of the RME value.

TABLE C-3 (Continued)

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Future On-Site Construction Workers

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Exposure duration (ED)	1 year	2 year	It is assumed that on-site construction is a temporary work.
Dermal permeability constant (PC)	Chemical-specific	Chemical-specific	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Applications" EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in a separate table.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals and 0.1% (0.001) for inorganic chemicals were recommended in the document.
Fraction Contaminated (FI)	0.5 for soils, sediments, surface water and groundwater	1.0 for soils, sediments, surface water and groundwater	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	70 kg	70 kg	Conventional adult body weight (RAGS, 12/89)
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89)

TABLE C-4

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Future On-Site Workers

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Chemical concentration in surface water (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively. "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual", (RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in soils and sediments (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	RAGS 12/89.
Surface water ingestion rate (IR)	25 ml/day	50 ml/day	RME is from RAGS, 12/89 and RAE is a half of RME value.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represent mean and reasonable maximum exposure concentration. Chemical concentrations in air from soil particles and volatilized chemical concentrations in groundwater are estimated by screening level model. Detailed calculations are presented in Appendix.
Soil and sediment ingestion rate (IR)	10 mg/day	50 mg/day	RME value is EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is from Exposer Factor Handbook (EFH), 3/90.
Inhalation rate (IR) for soil particles and VOCs in air from soils	0.83 m3/hr	2.5 m3/hr	RME inhalation rate of 2.5 m3/hr is obtained by 20 m3/8 hour work day. An inhalation rate of RAE is 1/3 of 8 hour working day. These two values are conservative estimates for the inhalation rates.
Skin surface area (SA) (for surface water, soil, and sediment dermal contacts)	5,000 cm^2	5,800 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. 5,000 cm2 is a 25% of the total body surface area for RAE (20,000 cm2) and 5,800 cm2 is a 25% of the total body surface area for RME listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.
Exposure time (ET) for surface water dermal contact	1 hr/day	2 hr/day	Both values are conservative estimates of exposure time.
Exposure Time (ET) for outdoor inhalation	4 hr/day	8 hr/day	RME is from 8 hours/day, 5 days a week schedule. RAE is a half of the RME value.
Exposure frequency (EF) for incidental ingestion and dermal contact of surface water and sediments	26 days/year	52 days/year	RME value is used assuming that exposures by these route occur twice a week during the months when there is no snow cover on the ground, or not frozen. RAE is a half of RME value.

TABLE C-4 (Continued)

Exposure Assumptions and Intake Parameters Through Ingestion, Inhalation, and Dermal Contact for Future On-Site Workers

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Exposure frequency (EF)	250 days/year	250 days/year	EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91).
Exposure duration (ED)	9 year	25 year	EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91) .
Dermal permeability constant (PC)	Chemical-specific	Chemical-specific	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Applications"s" EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in tables.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals and 0.1% (0.001) for inorganic chemicals were recommended in the document.
Fraction Contaminated (FI)	0.5 for soils, sediments, surface water and groundwater	1.0 for soils, sediments, surface water and groundwater	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	70 kg	70 kg	Conventional adult body weight (RAGS, 12/89)
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89)

Footnote: *1 RAE= Reasonable Average Exposure
*2 RME= Reasonable Maximum Exposure

TABLE C-5

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Current and Future Adult Trespassers

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Chemical concentration in surface water (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual", (RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in soils and sediments (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	RAGS 12/89.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represents mean and reasonable maximum exposure concentration. Chemical concentrations in air as soil particles and volatilized chemicals in groundwater during showering are estimated by screening level models. Detailed calculations are presented in Appendix.
Soil and sediment ingestion rate (IR)	10 mg/day	100 mg/day	RME value is from EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is from EPA Exposure Factors Handbook (EFH), EPA/600/8-89/043, 3/90.
Inhalation rate (IR) for soil particles and VOCs in air from soils	0.83 m3/hr	1.05 m3/hr	Average rate was calculated from a daily inhalation rate of 20 m3/day divided by 24, and RME value was calculated from a daily inhalation rate of 25 m3/day divided by 24. EFH, 3/90.
Skin surface area (SA) (for surface water, and sediment dermal contacts)	5,000 cm^2	5,800 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. 5,000 cm2 is a 25% of the total body surface area for RAE (20,000 cm2) and 5,800 cm2 is a 25% of the total body surface area for RME listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.
Exposure Time (ET) for outdoor inhalation	2 hr/day	4 hr/day	Both the average and reasonable maximum exposure times are conservative estimates of the amount of time an adult resident spend on the site each day regardless of weather condition.
Exposure time (ET) for surface water dermal contact	1 hr/day	2 hr/day	Both RAE and RME values are conservative estimates of exposure time to surface water and sediments.

TABLE C-5 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Current and Future Adult Trespassers

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Exposure frequency (EF) for incidental ingestion and dermal contact of soils and sediments	26 days/year	52 days/year	Both the average and reasonable maximum exposure times are the same as off-site adult residential exposure scenarios. These values are conservative estimates that an adult trespassers have incidental ingestion and dermal contact with soils and sediments. It was assumed that exposures occurs once a week for RME scenario and 1/2 value of the RME was used for RAE scenario.
Exposure frequency (ET) for inhalation of soil particle and VOCs	26 days/year	52 days/year	RME value assumes that trespassing occur once a week and RAE is a half of RME.
Exposure duration (ED)	9 year	30 year	Mean and national upper bound time at one residence (RAGS 12/89). 30 yr exposure duration was used since an adult and a child residential exposures were evaluated separately. 6 years (0-6 years) and 30 years (7-adult).
Dermal permeability constant (PC)	Chemical-specific	Chemical-specific (unitless)	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Applications"s" EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in Tables.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals and 0.1% (0.001) for inorganic chemicals were recommended in the document.
Fraction Contaminated (FI)	0.5 for soils, sediments; surface water and groundwater	1.0 for soils, sediments, surface water and groundwater	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	70 kg	70 kg	Conventional adult body weight (RAGS, 12/89)

TABLE C-5 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Current and Future Adult Trespassers

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89)

*1 RAE= Reasonable Average Exposure
*2 RME= Reasonable Maximum Exposure

TABLE C-6

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Current and Future Child Trespassers

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Chemical concentration in surface water (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively, "Risk Assessment Guidance for Superfund: Volume I - Health Evaluation Manual", (RAGS), EPA/540/1-89/002, 12/89.
Chemical concentration in soils and sediment (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	RAGS 12/89.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represents mean and reasonable maximum exposure concentration. Chemical concentrations in air from soil particles and volatilized chemical concentrations in groundwater are estimated by screening level models. Detailed calculations are presented in Appendix.
Surface water ingestion rate (IR)	25 ml/day	50 ml/day	Both ingestion rate for RAE and RME are conservative estimates.
Soil and sediment ingestion rate (IR)	100 mg/day	200 mg/day	Recommended ingestion rate for children, RAGS, 12/89.
Inhalation rate (IR) for soil particles and VOCs in air from soils	0.4 m3/hr	0.8 m3/hr	Average rate was calculated from a daily inhalation rate of 20 m3/day divided by 24, and RME value was calculated from a daily inhalation rate of 25 m3/day divided by 24. EPA Exposure Factors Handbook, EPA/600/8-89/043, 3/90.
Skin surface area (SA) (for surface water, soil, and sediment dermal contacts)	1.250 cm^2	1.450 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B, 1/92. 1.250 cm^2 is a 25% of the total body surface area for RAE (7,930 cm^2) and 1.450 cm^2 is a 25% of the total body surface area for RME (9,180 $cm^{2)}$ listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.
Exposure frequency (EF) for incidental ingestion and dermal contact of surface water and sediments	26 days/year	52 days/year	These values are the same as current off-site residential exposure scenarios. RME value is derived assuming exposures occur one a week, and RAE value is 1/2 of the RME value.
Exposure duration (ED)	1 year	2 year	A child exposure is 6 years (0-6 years) . It was assumed that children between age 5-6 were trespassers.

TABLE C-6 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Current and Future Child Trespassers

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Exposure time (ET) for surface water dermal contact	1 hr/day	2 hr/day	Both RAE and RME are conservative estimates of exposures to surface water.
Dermal permeability constant (PC)	Chemical-specific	Chemical-specific	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Applications"s" EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in Tables.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals and 0.1% (0.001) for inorganic chemicals were recommended in the document.
Fraction Contaminated (FI)	0.5 for soils, sediments surface water and groundwater	1.0 for soils, sediments surface water and groundwater	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	15 kg	15 kg	Conventional adult body weight (RAGS, 12/89)
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89)

*1 RAE= Reasonable Average Exposure
*2 RME= Reasonable Maximum Exposure

TABLE C-7

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Current Off-Site Adult Residents

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Chemical concentration in surface water and groundwater (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual", (RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in sediments (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively RAGS 12/89.
Groundwater Ingestion rate (IR)	1.4 liters/day	2 liters/day	Recommended groundwater ingestion rate - RAGS 12/89.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represents mean and reasonable maximum exposure concentration. Air concentrations for surface particles from soils to air and volatilized chemical concentrations in groundwater during showering are estimated by screening level models and presented in summary Tables. Detailed calculations for modeling are presented in Appendix.
Sediment ingestion rate (IR)	10 mg/day	100 mg/day	RME value is from EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is from Exposure Factor Handbook (EFH, EPA/600/8-89/043, 3/90).
Ingestion rate (IR) of Surface water	25 ml/hr	50 ml/hr	RME is recommended in RAGS 12/89, and RAE is a half of the RME value.
Inhalation rate (IR) for soil particles and VOCs in air	0.83 m3/hr	1.05 m3/hr	RME value is calculated from a daily inhalation rate of 20 m3/day divided by 24, and RME value was calculated from a daily inhalation rate of 25 m3/day divided by 24. EFH 3/90.
Inhalation rate (IR) (for showering)	0.6 m3/hr	0.6 m^3/hr	Recommended inhalation rate during showering (RAGS, 12/89).
Skin surface area (SA) (for showering)	20,000 cm^2	23,000 cm^2	19,400 m2 is a 50th percentile adult male body surface area (RAGS 12/89). Total skin surface values used for the calculations were selected from EPA's "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-091/011B, 1/92 and recommended in the text.

TABLE C-7 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Current Off-site Adult Residents

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Skin surface area (SA) (for surface water and sediment dermal contacts)	5,000 cm^2	5,800 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B, 1/92. 5,000 cm2 is a 25% of the total body surface area for RAE (20,000 cm2) and 5,800 cm2 is a 25% of the total body surface area for RME listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.
Exposure Time (ET) for showering	(7 min/day) 0.12 hr/day	(12 min/day) 0.2 hr/day	50th and 90th percentile amount of time for showering (RAGS, 12/89).
Exposure Time (ET) for outdoor inhalation	2 hr/day	4 hr/day	Both the average and reasonable maximum exposure times are conservative estimates of the amount of time an adult resident spends on the site each day regardless of weather condition.
Exposure Time (ET) for surface water dermal contact	1 hr/day	2 hr/day	Both the average and reasonable maximum exposure times are conservative estimates of the amount of time an adult resident spends on the site each day regardless of weather condition.
Exposure frequency (EF) for incidental ingestion and dermal contact of sediments and surface water	26 days/year	52 days/year	RAE value is assumed that sediment and soil contacts/incidental ingestion occur once a week in six month period, and RME value is assumed that exposures of the same routes occur twice a week in six month period.
Exposure frequency (EF) for groundwater inhalation (for showering)	275 days/year	350 days/year	RME is from EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE is a 2/3 of the RME value.
Exposure duration (ED)	9 year	30 year	Mean and national upper bound time at one residence (RAGS 12/89). 30 yr exposure duration was used since an adult and a child residential exposures were evaluated separately. 6 years (0-6 years) and 30 years (7-adult).
Dermal permeability constant (PC)	Chemical-specific (unitless)	Chemical-specific	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in separate Tables.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.

TABLE C-7 (Continued)

Exposure Assumptions and Intake Factors through Ingestion, Inhalation, and Dermal Contact for Current Off-site Adult Residents

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals; 0.1% (0.001) for inorganic chemicals.
Fraction Contaminated (FI)	0.5 for soils and sediments; 1.0 (100%) for surface water and groundwater.	1.0 for soils, sediments, surface water and groundwater.	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	70 kg	70 kg	Conventional adult body weight (RAGS, 12/89)
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89). An averaging time for carcinogens is 25550 days.

Footnotes: *1 RAE = Reasonable Average Exposure
*2 RME= Reasonable Maximum Exposure

TABLE C-8

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Current Off-Site Child Residents

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Chemical concentration in surface water and groundwater (CW)	Arithmetic mean	95% upper confidence limit concentration or maximum concentration	Mean and 95% upper confidence limit concentrations of arithmetic mean are used for reasonable average exposure (RAE) and reasonable maximum exposure (RME), respectively. "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual", (RAGS) EPA/540/1-89/002, 12/89.
Chemical concentration in sediments (CS)	Arithmetic mean	95% upper confidence limit of arithmetic mean	RAGS 12/89.
Surface water ingestion rate (IR)	25 ml/day	50 ml/day	RME value is from RAGS, 12/89, and RAE is a half of the RME value.
Groundwater Ingestion rate (IR)	1.0 liters/day	1.5 liters/day	Values were from EPA's "Exposure Factors Handbook " (EFH, EPA/600/8-89/043,7/89). There are several different drinking water intake rates available in the document: 1 liter/day for children under 10 kg; 0.9 liter/day for 2 year olds; 1.5 liter/day for children between 14-16 years; an average of 0.76 liter/day for children 0 to 9; and a range of 1-1.7 liter/day for children 5-14 years. A value of 1 liter/day for RAE is reasonable for children age 0-6 in this exposure scenario, and is consistent with the ranges cited in the guidance. The RME value of 1.5 liter/day was used because the document also cited a range of water consumption of 1-1.7 liter/day for children 5-14 years.
Chemical concentration in air (CA)	Modeled mean value	Reasonable maximum concentration value from modeled values.	Represents mean and reasonable maximum exposure concentration. Chemical concentrations as soil particles in air and volatilized chemicals in groundwater are estimated by screening level models, and presented in Appendix.
Sediment ingestion rate (IR)	100 mg/day	200 mg/day	Recommended sediment ingestion rate for children, RAGS, 12/89.
Inhalation rate (IR) for soil particles in air and VOCs from soils	0.4 m3/hr	0.8 m3/hr	Average rate was calculated from a daily inhalation rate of 20 m3/day divided by 24, and RME value was calculated from a daily inhalation rate of 25 m3/day divided by 24. EPA Exposure Factors Handbook, EPA/600/8-89/043, 3/90.
Inhalation rate (IR) (for showering)	0.6 m3/hr	0.6 m^3/hr	Recommended inhalation rate during showering (RAGS, 12/89).
Skin surface area (SA) (for showering)	7,930 cm^2	9,180 cm^2	Total skin surface values used for the calculations were selected from EPA's "Dermal Exposure Assessment: Principles and Application ". EPA/600/8-091/011B, 1/92. 7,930 cm^2 is a 50th percentile of total body surface area of male children at age 5-6 years old. 9,180 cm^2 is a 95th percentile of total body surface area of male children age 5-6 years from the same Table 8-4.

TABLE C-8 (Continued)

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Current Off-Site Child Residents

Exposure or Intake Parameter	Values for RAE*[1]	Values for RME*[2]	Rationale/Discussion/Reference
Skin surface area (SA) (for surface water and sediment dermal contacts)	1,250 cm^2	1,450 cm^2	Recommended values from EPA's "Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B, 1/92. 1.250 cm^2 is a 25% of the total body surface area for RAE (7,930 cm^2) and 1.450 cm^2 is a 25% of the total body surface area for RME (9,180 cm^2) listed in the same document. These value represent an individual wearing a short sleeve shirt, shorts, and shoes for RAE and RME exposure scenarios, respectively. The exposed skin surface represents the head, hands, forearms, and lower legs.
Exposure frequency (EF) for showering	275 days/year	350 days/year	RME value is from EPA's "Standard Default Exposure Factors (SDEF)", OSWER Directive 9285.6-03 (3/25/91). RAE value is 2/3 of the RME value.
Exposure frequency (EF) for incidental ingestion and dermal contact with surface water and sediments	26 days/year	52 days/year	RME value assumed that exposure to these media occur once a week, and the RAE value is a half of the RME.
Exposure Time for Showering (ET)	(7 min/day) 0.12 hr/day	(12 min/day) 0.2 hr/day	50th and 90th percentile amount of time for shower (RAGS, 12/89).
Exposure Time (ET) for surface water dermal contact	1 hr/day	2 hr/day	Both RME and RAE values are conservative estimates for exposure to surface water.
Exposure Time (ET) for outdoor inhalation	2 hr/day	4 hr/day	Both the average and reasonable maximum exposure times are conservative estimates of the amount of time an adult resident spend on the site each day regardless of weather condition.
Dermal permeability constant (PC)	Chemical-specific	Chemical-specific	Values selected from EPA'S " Dermal Exposure Assessment: Principles and Application"s" EPA/600/8-91/011B, 1/92. Concentrations adjusted with permeability constants are presented in tables.
Adherence Factor (AF)	0.2	1.0	The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used.
Absorption Factor (AB)	Chemical-specific (unitless)	Chemical-specific (unitless)	Absorption factor is chemical-specific. AB is expressed as a fraction between 0 and 1. The values recommended by EPA Region IV in supplemental risk assessment guidance (2/11/92) were used. 1% (0.01) for organic chemicals and 0.1% (0.001) for inorganic chemicals were recommended in the document. Adjusted chemical concentrations with absorption factors are presented in a separate Table.

TABLE C-8 (Continued)

Exposure Assumptions and Intake Parameters through Ingestion, Inhalation, and Dermal Contact for Current Off-Site Child Residents

Exposure or Intake Parameter	Values for RAE*1	Values for RME*2	Rationale/Discussion/Reference
Fraction Contaminated (FI)	0.5 for soils and sediments; 1.0 for surface water and groundwater	1.0 for soils, sediments, surface water and groundwater	RME exposure assumes 100% contamination of soils, sediments, surface water and groundwater. The value of RAE assumes that not more than 50% of the soils and sediments are contaminated with chemicals of concern.
Exposure duration (ED)	6 year	6 year	A child exposure is 6 years (0-6 years) , RAGS, 12/89.
Conversion factor (CF)	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	1E-6 (kg/mg) for ingestion routes; 1E-3 (liter/cm3) for dermal routes	Conventional calculations (RAGS, 12/89).
Body weight (BW)	15 kg	15 kg	Conventional adult body weight (RAGS, 12/89)
Averaging time (AT)	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Non-carcinogens: 365 dy/yr x ED yr Carcinogens: 365 dy/yr x 70 yr	Conventional averaging times (RAGS, 12/89)

Footnotes: *1 RAE= Reasonable Average Exposure
*2 RME= Reasonable Maximum Exposure

TABLE C-9

Uncertainty Analysis in the Baseline Risk Assessment

Assumption	Qualitative Level Uncertainty	Qualitative Effect of Assumption on Risk or Hazard Estimate	Discussion
SAMPLING AND ANALYSIS IMPACTS			
Inclusion of chemicals present in samples due to sampling and analysis errors.	Low to moderate	Overestimate	Some organic chemicals were commonly found in method, trip, or field blanks, and some of chemicals were identified as a lab. contaminant.
Limited background information was available for most media and none for surface water	Low to moderate	Overestimate	Some chemicals may have been retained in the assessment because limited background information was available with which to compare the concentrations detected at the site.
Biased/unbiased sampling strategy	Low to moderate	Overestimate	Sampling was performed in areas of known previous site activities. Media chemical concentrations measured are likely to represent the "worst case" rather than average chemical concentrations across the site. The use of this data would result in an overestimate of potential health impacts. This was especially true in the groundwater samples collected. Geoprobe point GP-21 contained a large quantity of TCE, but the site study indicated that this point does not represent the groundwater wells at the site. If GP-21 has no connection to the water table, health impacts due to groundwater consumption will be overestimated.
ESTIMATION OF EXPOSURE			
Use of EPA default exposure factors for certain pathways	Moderate to high	Overestimate	Default exposure factors developed by EPA (OSWER Directive 9285.6-03, 3/25/91) were applied to calculate risk and hazard estimated for exposure pathways and scenarios addressed in the directive. Use of these factors is designed to provide an estimate of a reasonable maximum exposure, rather than reflect more typical or average exposure. The default values of skin surface area, ingestion rates for an adult a child resident through the sediment, and soils are very conservative, and may overestimate health hazards and risks by those intake pathways.
Assumption that residents will reside on the site boundary in the future and relay on local groundwater exclusively	Moderate to High	Overestimate	The hypothetical future on-site residential exposure scenario assumes that 1) residents will build the housed on the site in the future and 2) that these residences will rely on local groundwater exclusively for their daily water needs. Currently, there is no residence on the site, and it is unlikely that residences will build residential houses on the site. Homes around the site are connected to city water supply.

Assumption	Qualitative Level Uncertainty	Qualitative Effect of Assumption on Risk or Hazard Estimate	Discussion
Assumption that the concentrations of chemicals detected in groundwater on the-site equals to the concentrations of chemicals in groundwater located at off-site	High	Overestimate	Exposure point concentrations in each medium for off-site residents (adult and child) were assumed to be same as the chemical concentrations detected at the site. This assumption ignores the chemical fate and dilution factors occur during the transport. Some of factors should be considered are: 1) volatilization of chemicals from site soils; 2) degradation of chemicals from surface soils, sediments and surface water by UV light; 3) Degradation of organic chemicals by soil microorganisms; and 4) dilution of chemicals from the site to down gradient. These factors were not utilized, in addition in order to provide the most conservative approach only risk for potential on-site residents were calculated.
Assumption that trespassing will occur frequently for 30 years	High	Overestimate	It was assumed that trespassing would occur weekly, year-round, for 30 years.
Assumption that workers have frequent contact with soils outside of the manufacturing building	Moderate to high	Overestimate	Given that the bulk of the work is performed inside the manufacturing building, impacted areas of the site are paved and workers probably have minimal real contact with soil, this assumption overestimates potential health risks.
Assumption that soils are available for contact	Low to moderate	Overestimate	The assumption used in the exposure scenario for on-site residents, off-site residents, workers, trespassers, and construction workers all assume the frequent dermal contact to the soils contaminated at the site. This assumption may overestimate potential risks.
Assumption of normal statistical distribution of chemical data at the site	Low to high	Overestimate or no effect	There has not been a sufficient level of sampling to perform exhaustive statistical analysis on the data. For purposes of the risk calculations worst case concentrations (highest) were used for each location.
USE OF CONSERVATIVE TOXICITY VALUES			
Use of EPA Reference Doses (RfDs) for non-carcinogenic effects and slope factors (SFs) for carcinogenic effects	Low to moderate	Overestimate or underestimate	EPA derives toxicity values conservative enough to protect sensitive human populations. Some Sfs are derived directly from the human epidemiological data. When human data are available, uncertainty factors are between 3 to 10. For most chemicals with no human data, the uncertainty factors range between 100 to 1000. Slope factors are obtained using the linealized multi-stage model (LMS). The model extrapolates a 95% upper confidence limit on the dose response curve. The LMS is a very conservative model and therefore potential risks may be overestimated.
Use of oral toxicity values for the dermal exposure pathway	Low	Minimal effect	Oral SFs were used to assess the intake of chemicals through the dermal route. The administered SFs were modified by using absorption factor (AF) and dermal permeability constant (PC) to estimate the absorbed doses. AFs and PC values are not absolute values and contain another uncertainties, but this estimate should provide a reasonable dermal uptake and toxicity values associated with the uptake.

TABLE C-10

Chronic Oral and Inhalation Reference Doses and Slope Factors For Chemicals of Human Concern

Chemical Name	Oral Reference Dose RfD (mg/kg-day)	Uncertainty Factor	Inhalation Reference Concentration RfC (mg/m^3)	Inhalation Reference Dose[a] (mg/kg-day)	Oral Slope Factor (mg/kg-day)$^{-1}$	Inhalation Unit risk (mg/m^3)$^{-1}$	Inhalation Slope Factor[b] (mg/kg-day)$^{-1}$	Carcinogen Classification Weight of Evidence
Chloroform	0.01	NA	5.45E-16	ND	0.0061	NA	0.081	B
1,1-Dichloroethane	0.1	NA	2.97E-16	.01	ND	NA	ND	D
1,1-Dichloroethene	0.009	NA	1.13E-16	ND	0.6	NA	1.2	C
Total 1,2-Dichloroethene	0.01	NA	2.12E-15	ND	ND	NA	ND	D
Tetrachloroethene	0.01	NA	1.05E-16	ND	0.051	NA	1.3E-3	B
1,1,1-Trichloroethane	0.09	NA	1.64E-16	.03	ND	NA	ND	D
Trichloroethene	ND	NA	2.99E-15	ND	1.1E-2	NA	1.7E-2	B

A = Human carcinogen
B = Probable human carcinogen
C = Possible human carcinogen
D =Not classifiable as to human carcinogenicity

NA = Not Applicable
ND = Not Determined
NE = Not Evaluated

[a]Inhalation Reference Concentration (RfC) expressed in mg/m^3 is more appropriate for the inhalation exposure route. However, EPA allows for the uses of converted inhalation reference dose expressed in mg/kg-day for the quantitative assessment.

[b]Inhalation Unit Risk in (mg/m^3)$^{-1}$ is more appropriate for expressing carcinogenic potency by the inhalation route. However, EPA allows the uses of inhalation slope factor expressed in (mg/kg-day)$^{-1}$ for the quantitative risk assessment.

TABLE C-11

CHEMICAL AND PHYSICAL PROPERTIES OF ORGANIC CHEMICALS OF CONCERN
CMW, INC.
INDIANAPOLIS, INDIANA

Organic Chemicals	Vapor Pressure[1] (mm/Hg)	Henry's Law[0] Constant (Pa-m^3/mole)	Water Solubility[2] (g/m^3)	Log BCF (See notes)	Log Kow[2] (See notes)	Log Koc[1] (see notes)	Molecular Weight[1] (g mol @ 25°C)	Specific Gravity(2)
Chloroform	160 @ 20°C	382.07	1.97 @ 25°C	0.75	1.97	2.79-1.44	119.38	1.489 @ 20°C
1,1-Dichloroethane	180 @ 20°C	628.18	4767 @ 25°C	0.61	1.79	1.63-1.48	98.96	1.174 @ 20/4°
1,1-Dichloroethene	500 @ 20°C	2333.63	3344 @ 25°	0.88	2.13	2.18-1.81	96.94	1.218 @ 20/4°C
cis 1,2-Dichloroethene	202 @ 20°C	747.82	3500 @ 25°C	0.67	1.86	1.69	96.94	1.28 @ 20°C
trans 1,2-Dichloroethene	333 @ 20°C	687.56	6260 @ 25°C	0.72	1.93	1.77-1.56	96.94	1.26 @ 20°C
Tetrachloroethene	18 @ 20°C	2669.86	150 @ 25°C	1.47	2.88	3.23-2.04	165.83	1.62 @ 20°C
1,1,1-Trichloroethane	100 @ 20°C	1472.42	1495 @ 25°	1.16	2.49	3.02-1.65	133.41	1.35 @ 20/4°
Trichloroethene	60 @ 20°C	1183.7	1000 @ 25°C	1.2	2.53	3.39-1.52	131.39	1.46 @ 20°C

Notes:
(1) Verscheuren, Handbook of Environmental Data on Organic Chemicals, Second Edition (1983).
(2) McKay, Donald, et al, Illustrated Handbook of Physical-Chemical Properties and Environmental Fate for Organic Chemicals, Volume 3 (1993).

Log BCF = logarithm (base 10) of the bioconcentration factor = 0.79 log Kow-0.40-log(7.6/3.0)
Log Kow = logarithm (base 10) of the octanol/water partition coefficient
Log Koc = logarithm (base 10) of the organic carbon/partition coefficient
NA = Data Not Available

TABLE C-12

Absorption Factor of Chemicals of Concern - Detected in Soils

Chemical Name	Absorption Factor (AB) for Chemical (Unitless)	Maximum Concentration of Chemical Detected in Soils (ug/kg)	Dermal Absorption Conc. of Chemical in Soils (ug/kg) Adjusted with AB
Chloroform	0.01	630	6.30
1,1-Dichloroethane	0.01	260	2.60
1,1-Dichloroethene	0.01	180	1.80
Total 1,2-Dichloroethene	0.01	4900	49.00
Tetrachloroethene	0.01	2200	22.00
1,1,1-Trichloroethane	0.01	5000	50.00
Trichloroethene	0.01	48000	480.00

Absorbed concentration = [Chemical Concentration in Soils] x Absorbent Factor (AB).

The absorption factors used for the above chemicals were from US EPA Region IV (Guidance letter of 2/11/92).
1.0% for organics (AB = 0.01)
0.1% for inorganics (AB = 0.001)

APPENDIX D

EQUATIONS AND CALCULATIONS

FOR RISK QUANTIFICATION SCENARIOS

TABLE D-1

CMW - SUMMARY OF CARCINOGENIC RISK[1]

RECEPTOR	INGESTION OF SOIL (RAE/*RME*)	DERMAL CONTACT WITH SOIL (RAE/*RME*)	INHALATION OF VAPORS FROM SOIL (*RME* only)	INHALATION OF SOIL PARTICLES (*RME* only)
Most Recent Data from Stockpiled Soil (from Table B-1)				
Hypothetical On-site Resident Adult	$6x10^{-11}$ *$1x10^{-8}$*	$1x10^{-10}$ *$8x10^{-9}$*	*$5x10^{-18}$*	*$9x10^{-11}$*
Hypothetical On-Site Resident Child	$2x10^{-9}$ *$3x10^{-8}$*	$1x10^{-10}$ *$3x10^{-9}$*	*$4x10^{-18}$*	*$8x10^{-11}$*
Construction Worker	$1x10^{-12}$ *$2x10^{-10}$*	$3x10^{-12}$ *$2x10^{-10}$*	*$7x10^{-19}$*	*$1x10^{-11}$*
On-Site Worker	$5x10^{-11}$ *$4x10^{-9}$*	$1x10^{-10}$ *$5x10^{-9}$*	*$2x10^{-17}$*	*$3x10^{-10}$*
Trespasser Adult	$3x10^{-13}$ *$4x10^{-10}$*	$1x10^{-11}$ *$1x10^{-9}$*	*$7x10^{-19}$*	*$1x10^{-11}$*
Trespasser Child	$8x10^{-12}$ *$7x10^{-10}$*	$1x10^{-11}$ *$4x10^{-10}$*	*$6x10^{-19}$*	*$1x10^{-11}$*
Off-Site Resident Adult	NA	NA	*$5x10^{-18}$*	*$9x10^{-11}$*
Off-Site Resident Child	NA	NA	*$4x10^{-18}$*	*$8x10^{-11}$*
Data Collected During Excavation (from Table B-2)				
RECEPTOR	**INGESTION OF SOIL (RAE/*RME*)**	**DERMAL CONTACT WITH SOIL (RAE/*RME*)**	**INHALATION OF VAPORS FROM SOIL (*RME* only)**	**INHALATION OF SOIL PARTICLES (*RME* only)**
Hypothetical On-site Resident Adult	$6x10^{-10}$ *$3x10^{-7}$*	$1x10^{-9}$ *$2x10^{-7}$*	*$1x10^{-17}$*	*$2x10^{-10}$*
Hypothetical On-Site Resident Child	$2x10^{-8}$ *$6x10^{-7}$*	$2x10^{-9}$ *$6x10^{-8}$*	*$2x10^{-17}$*	*$3x10^{-10}$*
Construction Worker	$2x10^{-11}$ *$4x10^{-9}$*	$3x10^{-11}$ *$4x10^{-9}$*	*$6x10^{-19}$*	*$1x10^{-11}$*
On-Site Worker	$6x10^{-10}$ *$9x10^{-8}$*	$1x10^{-9}$ *$1x10^{-7}$*	*$3x10^{-17}$*	*$4x10^{-10}$*
Trespasser Adult	$3x10^{-12}$ *$7x10^{-9}$*	$1x10^{-10}$ *$3x10^{-8}$*	*$1x10^{-18}$*	*$2x10^{-11}$*
Trespasser Child	$9x10^{-11}$ *$1x10^{-8}$*	$2x10^{-10}$ *$9x10^{-9}$*	*$2x10^{-18}$*	*$3x10^{-11}$*
Off-Site Resident Adult	NA	NA	*$1x10^{-17}$*	*$2x10^{-10}$*
Off-Site Resident Child	NA	NA	*$2x10^{-17}$*	*$3x10^{-10}$*

RAE is Reasonable Average Exposure Scenario; *RME* is Reasonable Maximum Exposure Scenario; NA-Not Applicable

[1] The Hazard Index was also calculated for all scenarios with the result that all HIs were less than 0.00001 which essentially indicates an absense of noncarcinogenic toxicity.

TABLE D-2

INDEX OF TABLES FOR TABLE D-1
"CMW - SUMMARY OF CARCINOGENIC RISK"

Most Recent Data from Stockpiled Soil (from Table B-1) and Data Collected During Excavation (from Table B-2)				
RECEPTOR	**INGESTION OF SOIL (RAE/*RME*)**	**DERMAL CONTACT WITH SOIL (RAE/*RME*)**	**INHALATION OF VAPORS FROM SOIL[1] (*RME* only)**	**INHALATION OF SOIL PARTICLES[2] (*RME* only)**
Hypothetical On-site Resident Adult	D-3.1 *D-3.2*	D-4.1 *D-4.2*	*D-5.1*	
Hypothetical On-Site Resident Child	D-3.3 *D-3.4*	D-4.3 *D-4.4*	*D-5.2*	
Construction Worker	D-3.5 *D-3.6*	D-4.5 *D-4.6*	*D.5.3*	
On-Site Worker	D-3.7 *D-3.8*	D-4.7 *D-4.8*	*D-5.4*	
Trespasser Adult	D-3.9 *D-3.10*	D-4.9 *D-4.10*	*D-5.5*	
Trespasser Child	D-3.11 *D-3.12*	D-4.11 *D-4.12*	*D-5.6*	
Off-Site Resident Adult	NA	NA	*D-5.7*	
Off-Site Resident Child	NA	NA	*D-5.8*	

RAE is Reasonable Average Exposure Scenario; *RME* is Reasonable Maximum Exposure Scenario; NA-Not Applicable

[1]Tables depicting supporting calculations appear in Tables D-6.1 and D-6.2

[2]Tables depicting supporting calculations appear in Tables D-7.1 through D-7.4

TABLE D-3.1
CMW SITE - REASONABLE AVERAGE EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	10	0.5	1	275	9	1E-06	70	365	9	70	1.51E-09	0.01	0.000000151	1.94E-10	0.0061	1E-12
1,1-Dichloroethane	0.018	10	0.5	1	275	9	1E-06	70	365	9	70	9.69E-10	0.1	0.000000010	1.25E-10		0E+00
1,1-Dichloroethene	0.005	10	0.5	1	275	9	1E-06	70	365	9	70	2.69E-10	0.009	0.000000030	3.46E-11	0.6	2E-11
1,2-Dichloroethene	0.047	10	0.5	1	275	9	1E-06	70	365	9	70	2.53E-09	0.01	0.000000253	3.25E-10		0E+00
Tetrachloroethene	0.034	10	0.5	1	275	9	1E-06	70	365	9	70	1.83E-09	0.01	0.000000183	2.35E-10	0.051	1E-11
1 1,1-Trichloroethane	0.109	10	0.5	1	275	9	1E-06	70	365	9	70	5.87E-09	0.09	0.000000065	7.54E-10		0E+00
Trichloroethene	0.293	10	0.5	1	275	9	1E-06	70	365	9	70	1.58E-08			2.03E-09	0.011	2E-11
												TOTAL HAZARD INDEX =		0.00	TOTAL CANCER RISK =		6E-11

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	10	0.5	1	275	9	1E-06	70	365	9	70	1.30E-08	0.01	0.000001297	1.67E-09	0.0061	1E-11
1,1-Dichloroethane	0.081	10	0.5	1	275	9	1E-06	70	365	9	70	4.36E-09	0.1	0.000000044	5.60E-10		0E+00
1,1-Dichloroethene	0.053	10	0.5	1	275	9	1E-06	70	365	9	70	2.85E-09	0.009	0.000000317	3.67E-10	0.6	2E-10
1,2-Dichloroethene	0.712	10	0.5	1	275	9	1E-06	70	365	9	70	3.83E-08	0.01	0.000003832	4.93E-09		0E+00
Tetrachloroethene	0.422	10	0.5	1	275	9	1E-06	70	365	9	70	2.27E-08	0.01	0.000002271	2.92E-09	0.051	1E-10
1,1,1-Trichloroethane	0.484	10	0.5	1	275	9	1E-06	70	365	9	70	2.60E-08	0.09	0.000000289	3.35E-09		0E+00
Trichloroethene	3.252	10	0.5	1	275	9	1E-06	70	365	9	70	1.75E-07			2.25E-08	0.011	2E-10
												TOTAL HAZARD INDEX =		0.0000	TOTAL CANCER RISK =		6E-10

TABLE D-3.2
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	100	1	1	350	30	1E-06	70	365	30	70	1.23E-07	0.01	0.00001233	5.28E-08	0.0061	3E-10
1,1-Dichloroethane	0.043	100	1	1	350	30	1E-06	70	365	30	70	5.89E-08	0.1	0.00000059	2.52E-08		0E+00
1,1-Dichloroethene	0.005	100	1	1	350	30	1E-06	70	365	30	70	6.85E-09	0.009	0.00000076	2.94E-09	0.6	2E-09
1,2-Dichloroethene	0.173	100	1	1	350	30	1E-06	70	365	30	70	2.37E-07	0.01	0.00002370	1.02E-07		0E+00
Tetrachloroethene	0.132	100	1	1	350	30	1E-06	70	365	30	70	1.81E-07	0.01	0.00001808	7.75E-08	0.051	4E-09
1,1,1-Trichloroethane	0.321	100	1	1	350	30	1E-06	70	365	30	70	4.40E-07	0.09	0.00000489	1.88E-07		0E+00
Trichloroethene	1.251	100	1	1	350	30	1E-06	70	365	30	70	1.71E-06			7.34E-07	0.011	8E-09
												TOTAL HAZARD INDEX =		0.00	TOTAL CANCER RISK =		1E-08

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	100	1	1	350	30	1E-06	70	365	30	70	1.08E-06	0.01	0.00010849	4.65E-07	0.0061	3E-09
1,1-Dichloroethane	0.253	100	1	1	350	30	1E-06	70	365	30	70	3.47E-07	0.1	0.00000347	1.49E-07		0E+00
1,1-Dichloroethene	0.175	100	1	1	350	30	1E-06	70	365	30	70	2.40E-07	0.009	0.00002664	1.03E-07	0.6	6E-08
1,2-Dichloroethene	3.778	100	1	1	350	30	1E-06	70	365	30	70	5.18E-06	0.01	0.00051753	2.22E-06		0E+00
Tetrachloroethene	2.021	100	1	1	350	30	1E-06	70	365	30	70	2.77E-06	0.01	0.00027685	1.19E-06	0.051	6E-08
1,1,1-Trichloroethane	2.714	100	1	1	350	30	1E-06	70	365	30	70	3.72E-06	0.09	0.00004131	1.59E-06		0E+00
Trichloroethene	26.388	100	1	1	350	30	1E-06	70	365	30	70	3.61E-05			1.55E-05	0.011	2E-07
												TOTAL HAZARD INDEX =		0.0010	TOTAL CANCER RISK =		3E-07

TABLE D-3.3
CMW SITE - REASONABLE AVERAGE EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - CHILD

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	100	0.5	1	275	6	1E-06	15	365	6	70	7.03E-08	0.01	0.0000070	6.03E-09	0.0061	3.68E-11
1,1-Dichloroethane	0.018	100	0.5	1	275	6	1E-06	15	365	6	70	4.52E-08	0.1	0.0000005	3.87E-09		0.00E+00
1,1-Dichloroethene	0.005	100	0.5	1	275	6	1E-06	15	365	6	70	1.26E-08	0.009	0.0000014	1.08E-09	0.6	6.46E-10
1,2-Dichloroethene	0.047	100	0.5	1	275	6	1E-06	15	365	6	70	1.18E-07	0.01	0.0000118	1.01E-08		0.00E+00
Tetrachloroethene	0.034	100	0.5	1	275	6	1E-06	15	365	6	70	8.54E-08	0.01	0.0000085	7.32E-09	0.051	3.73E-10
1,1,1-Trichloroethane	0.109	100	0.5	1	275	6	1E-06	15	365	6	70	2.74E-07	0.09	0.0000030	2.35E-08		0.00E+00
Trichloroethene	0.293	100	0.5	1	275	6	1E-06	15	365	6	70	7.36E-07			6.31E-08	0.011	6.94E-10
												TOTAL HAZARD INDEX =		0.00	TOTAL CANCER RISK =		1.75E-09

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	100	0.5	1	275	6	1E-06	15	365	6	70	6.05E-07	0.01	0.0000605	5.19E-08	0.0061	3.16E-10
1,1-Dichloroethane	0.081	100	0.5	1	275	6	1E-06	15	365	6	70	2.03E-07	0.1	0.0000020	1.74E-08		0.00E+00
1,1-Dichloroethene	0.053	100	0.5	1	275	6	1E-06	15	365	6	70	1.33E-07	0.009	0.0000148	1.14E-08	0.6	6.85E-09
1,2-Dichloroethene	0.712	100	0.5	1	275	6	1E-06	15	365	6	70	1.79E-06	0.01	0.0001788	1.53E-07		0.00E+00
Tetrachloroethene	0.422	100	0.5	1	275	6	1E-06	15	365	6	70	1.06E-06	0.01	0.0001060	9.08E-08	0.051	4.63E-09
1,1,1-Trichloroethane	0.484	100	0.5	1	275	6	1E-06	15	365	6	70	1.22E-06	0.09	0.0000135	1.04E-07		0.00E+00
Trichloroethene	3.252	100	0.5	1	275	6	1E-06	15	365	6	70	8.17E-06			7.00E-07	0.011	7.70E-09
												TOTAL HAZARD INDEX =		0.00	TOTAL CANCER RISK =		1.95E-08

TABLE D-3.4
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - CHILD

EQUATION:
Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	200	1	1	350	6	1E-06	15	365	6	70	1.15E-06	0.01	0.0001151	9.86E-08	0.0061	6E-10
1,1-Dichloroethane	0.043	200	1	1	350	6	1E-06	15	365	6	70	5.50E-07	0.1	0.0000055	4.71E-08		0E+00
1,1-Dichloroethene	0.005	200	1	1	350	6	1E-06	15	365	6	70	6.39E-08	0.009	0.0000071	5.48E-09	0.6	3E-09
1,2-Dichloroethene	0.173	200	1	1	350	6	1E-06	15	365	6	70	2.21E-06	0.01	0.0002212	1.90E-07		0E+00
Tetrachloroethene	0.132	200	1	1	350	6	1E-06	15	365	6	70	1.69E-06	0.01	0.0001688	1.45E-07	0.051	7E-09
1,1,1-Trichloroethane	0.321	200	1	1	350	6	1E-06	15	365	6	70	4.10E-06	0.09	0.0000456	3.52E-07		0E+00
Trichloroethene	1.251	200	1	1	350	6	1E-06	15	365	6	70	1.60E-05			1.37E-06	0.011	2E-08
												TOTAL HAZARD INDEX =		0.00	TOTAL CANCER RISK =		2.63E-08

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	200	1	1	350	6	1E-06	15	365	6	70	1.01E-05	0.01	0.00101260	8.68E-07	0.0061	5E-09
1,1-Dichloroethane	0.253	200	1	1	350	6	1E-06	15	365	6	70	3.23E-06	0.1	0.00003235	2.77E-07		0E+00
1,1-Dichloroethene	0.175	200	1	1	350	6	1E-06	15	365	6	70	2.24E-06	0.009	0.00024860	1.92E-07	0.6	1E-07
1,2-Dichloroethene	3.778	200	1	1	350	6	1E-06	15	365	6	70	4.83E-05	0.01	0.00483032	4.14E-06		0E+00
Tetrachloroethene	2.021	200	1	1	350	6	1E-06	15	365	6	70	2.58E-05	0.01	0.00258393	2.21E-06	0.051	1E-07
1,1,1-Trichloroethane	2.714	200	1	1	350	6	1E-06	15	365	6	70	3.47E-05	0.09	0.00038555	2.97E-06		0E+00
Trichloroethene	26.388	200	1	1	350	6	1E-06	15	365	6	70	3.37E-04			2.89E-05	0.011	3E-07
												TOTAL HAZARD INDEX =		0.01	TOTAL CANCER RISK =		5.51E-07

TABLE D-3.5
CMW SITE - REASONABLE AVERAGE EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE CONSTRUCTION WORKER - ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	10	0.5	1	60	1	1E-06	70	365	1	70	3.29E-10	0.01	0.00000003	4.70E-12	0.0061	3E-14
1,1-Dichloroethane	0.018	10	0.5	1	60	1	1E-06	70	365	1	70	2.11E-10	0.1	0.00000000	3.02E-12		0E+00
1,1-Dichloroethene	0.005	10	0.5	1	60	1	1E-06	70	365	1	70	5.87E-11	0.009	0.00000001	8.39E-13	0.6	5E-13
1,2-Dichloroethene	0.047	10	0.5	1	60	1	1E-06	70	365	1	70	5.52E-10	0.01	0.00000006	7.88E-12		0E+00
Tetrachloroethene	0.034	10	0.5	1	60	1	1E-06	70	365	1	70	3.99E-10	0.01	0.00000004	5.70E-12	0.051	3E-13
1,1,1-Trichloroethane	0.109	10	0.5	1	60	1	1E-06	70	365	1	70	1.28E-09	0.09	0.00000001	1.83E-11		0E+00
Trichloroethene	0.293	10	0.5	1	60	1	1E-06	70	365	1	70	3.44E-09			4.91E-11	0.011	5E-13
												TOTAL HAZARD INDEX =		0.000	TOTAL CANCER RISK =		1E-12

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	10	0.5	1	60	1	1E-06	70	365	1	70	2.83E-09	0.01	0.00000028	4.04E-11	0.0061	2E-13
1,1-Dichloroethane	0.081	10	0.5	1	60	1	1E-06	70	365	1	70	9.51E-10	0.1	0.00000001	1.36E-11		0E+00
1,1-Dichloroethene	0.053	10	0.5	1	60	1	1E-06	70	365	1	70	6.22E-10	0.009	0.00000007	8.89E-12	0.6	5E-12
1,2-Dichloroethene	0.712	10	0.5	1	60	1	1E-06	70	365	1	70	8.36E-09	0.01	0.00000084	1.19E-10		0E+00
Tetrachloroethene	0.422	10	0.5	1	60	1	1E-06	70	365	1	70	4.95E-09	0.01	0.00000050	7.08E-11	0.051	4E-12
1,1,1-Trichloroethane	0.484	10	0.5	1	60	1	1E-06	70	365	1	70	5.68E-09	0.09	0.00000006	8.12E-11		0E+00
Trichloroethene	3.252	10	0.5	1	60	1	1E-06	70	365	1	70	3.82E-08			5.45E-10	0.011	6E-12
												TOTAL HAZARD INDEX =		0.0000	TOTAL CANCER RISK =		2E-11

TABLE D-3.6
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE CONSTRUCTION WORKER - ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	50	1	1	130	2	1E-06	70	365	2	70	2.29E-08	0.01	0.00000229	6.54E-10	0.0061	4E-12
1,1-Dichloroethane	0.043	50	1	1	130	2	1E-06	70	365	2	70	1.09E-08	0.1	0.00000011	3.13E-10		0E+00
1,1-Dichloroethene	0.005	50	1	1	130	2	1E-06	70	365	2	70	1.27E-09	0.009	0.00000014	3.63E-11	0.6	2E-11
1,2-Dichloroethene	0.173	50	1	1	130	2	1E-06	70	365	2	70	4.40E-08	0.01	0.00000440	1.26E-09		0E+00
Tetrachloroethene	0.132	50	1	1	130	2	1E-06	70	365	2	70	3.36E-08	0.01	0.00000336	9.59E-10	0.051	5E-11
1,1,1-Trichloroethane	0.321	50	1	1	130	2	1E-06	70	365	2	70	8.17E-08	0.09	0.00000091	2.33E-09		0E+00
Trichloroethene	1.251	50	1	1	130	2	1E-06	70	365	2	70	3.18E-07			9.09E-09	0.011	1E-10
												TOTAL HAZARD INDEX =		0.000	TOTAL CANCER RISK =		2E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	50	1	1	130	2	1E-06	70	365	2	70	2.01E-07	0.01	0.00002015	5.76E-09	0.0061	4E-11
1,1-Dichloroethane	0.253	50	1	1	130	2	1E-06	70	365	2	70	6.44E-08	0.1	0.00000064	1.84E-09		0E+00
1,1-Dichloroethene	0.175	50	1	1	130	2	1E-06	70	365	2	70	4.45E-08	0.009	0.00000495	1.27E-09	0.6	8E-10
1,2-Dichloroethene	3.778	50	1	1	130	2	1E-06	70	365	2	70	9.61E-07	0.01	0.00009611	2.75E-08		0E+00
Tetrachloroethene	2.021	50	1	1	130	2	1E-06	70	365	2	70	5.14E-07	0.01	0.00005141	1.47E-08	0.051	7E-10
1,1,1-Trichloroethane	2.714	50	1	1	130	2	1E-06	70	365	2	70	6.90E-07	0.09	0.00000767	1.97E-08		0E+00
Trichloroethene	26.388	50	1	1	130	2	1E-06	70	365	2	70	6.71E-06			1.92E-07	0.011	2E-09
												TOTAL HAZARD INDEX =		0.0002	TOTAL CANCER RISK =		4E-09

TABLE D-3.7
CMW SITE - REASONABLE AVERAGE EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE ON-SITE WORKER - ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	10	0.5	1	250	9	1E-06	70	365	9	70	1.37E-09	0.01	0.000000137	1.76E-10	0.0061	1E-12
1,1-Dichloroethane	0.018	10	0.5	1	250	9	1E-06	70	365	9	70	8.81E-10	0.1	0.000000009	1.13E-10		0E+00
1,1-Dichloroethene	0.005	10	0.5	1	250	9	1E-06	70	365	9	70	2.45E-10	0.009	0.000000027	3.15E-11	0.6	2E-11
1,2-Dichloroethene	0.047	10	0.5	1	250	9	1E-06	70	365	9	70	2.30E-09	0.01	0.000000230	2.96E-10		0E+00
Tetrachloroethene	0.034	10	0.5	1	250	9	1E-06	70	365	9	70	1.66E-09	0.01	0.000000166	2.14E-10	0.051	1E-11
1,1,1-Trichloroethane	0.109	10	0.5	1	250	9	1E-06	70	365	9	70	5.33E-09	0.09	0.000000059	6.86E-10		0E+00
Trichloroethene	0.293	10	0.5	1	250	9	1E-06	70	365	9	70	1.43E-08			1.84E-09	0.011	2E-11

TOTAL HAZARD INDEX = 0.00 TOTAL CANCER RISK = 5E-11

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	10	0.5	1	250	9	1E-06	70	365	9	70	1.18E-08	0.01	0.000001179	1.52E-09	0.0061	9E-12
1,1-Dichloroethane	0.081	10	0.5	1	250	9	1E-06	70	365	9	70	3.96E-09	0.1	0.000000040	5.10E-10		0E+00
1,1-Dichloroethene	0.053	10	0.5	1	250	9	1E-06	70	365	9	70	2.59E-09	0.009	0.000000288	3.33E-10	0.6	2E-10
1,2-Dichloroethene	0.712	10	0.5	1	250	9	1E-06	70	365	9	70	3.48E-08	0.01	0.000003483	4.48E-09		0E+00
Tetrachloroethene	0.422	10	0.5	1	250	9	1E-06	70	365	9	70	2.06E-08	0.01	0.000002065	2.65E-09	0.051	1E-10
1,1,1-Trichloroethane	0.484	10	0.5	1	250	9	1E-06	70	365	9	70	2.37E-08	0.09	0.000000263	3.04E-09		0E+00
Trichloroethene	3.252	10	0.5	1	250	9	1E-06	70	365	9	70	1.59E-07			2.05E-08	0.011	2E-10

TOTAL HAZARD INDEX = 0.0000 TOTAL CANCER RISK = 6E-10

TABLE D-3.8
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INGESTION EXPOSURE TO SOILS
FUTURE ON-SITE WORKER - ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	50	1	1	250	25	1E-06	70	365	25	70	4.40E-08	0.01	0.00000440	1.57E-08	0.0061	1E-10
1,1-Dichloroethane	0.043	50	1	1	250	25	1E-06	70	365	25	70	2.10E-08	0.1	0.00000021	7.51E-09		0E+00
1,1-Dichloroethene	0.005	50	1	1	250	25	1E-06	70	365	25	70	2.45E-09	0.009	0.00000027	8.74E-10	0.6	5E-10
1,2-Dichloroethene	0.173	50	1	1	250	25	1E-06	70	365	25	70	8.46E-08	0.01	0.00000846	3.02E-08		0E+00
Tetrachloroethene	0.132	50	1	1	250	25	1E-06	70	365	25	70	6.46E-08	0.01	0.00000646	2.31E-08	0.051	1E-09
1 1,1-Trichloroethane	0.321	50	1	1	250	25	1E-06	70	365	25	70	1.57E-07	0.09	0.00000174	5.61E-08		0E+00
Trichloroethene	1.251	50	1	1	250	25	1E-06	70	365	25	70	6.12E-07			2.19E-07	0.011	2E-09

TOTAL HAZARD INDEX = 0.00 TOTAL CANCER RISK = 4E-09

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	50	1	1	250	25	1E-06	70	365	25	70	3.87E-07	0.01	0.00003875	1.38E-07	0.0061	8E-10
1,1-Dichloroethane	0.253	50	1	1	250	25	1E-06	70	365	25	70	1.24E-07	0.1	0.00000124	4.42E-08		0E+00
1,1-Dichloroethene	0.175	50	1	1	250	25	1E-06	70	365	25	70	8.56E-08	0.009	0.00000951	3.06E-08	0.6	2E-08
1,2-Dichloroethene	3.778	50	1	1	250	25	1E-06	70	365	25	70	1.85E-06	0.01	0.00018483	6.60E-07		0E+00
Tetrachloroethene	2.021	50	1	1	250	25	1E-06	70	365	25	70	9.89E-07	0.01	0.00009887	3.53E-07	0.051	2E-08
1,1,1-Trichloroethane	2.714	50	1	1	250	25	1E-06	70	365	25	70	1.33E-06	0.09	0.00001475	4.74E-07		0E+00
Trichloroethene	26.388	50	1	1	250	25	1E-06	70	365	25	70	1.29E-05			4.61E-06	0.011	5E-08

TOTAL HAZARD INDEX = 0.0003 TOTAL CANCER RISK = 9E-08

TABLE D-3.9
CMW SITE - REASONABLE AVERAGE EXPOSURE
INGESTION EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSERS -ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	10	0.5	0.083	26	9	1E-06	70	365	9	70	1.18E-11	0.01	0.000000001	1.52E-12	0.0061	9E-15
1,1-Dichloroethane	0.018	10	0.5	0.083	26	9	1E-06	70	365	9	70	7.60E-12	0.1	0.000000000	9.77E-13		0E+00
1,1-Dichloroethene	0.005	10	0.5	0.083	26	9	1E-06	70	365	9	70	2.11E-12	0.009	0.000000000	2.71E-13	0.6	2E-13
1,2-Dichloroethene	0.047	10	0.5	0.083	26	9	1E-06	70	365	9	70	1.98E-11	0.01	0.000000002	2.55E-12		0E+00
Tetrachloroethene	0.034	10	0.5	0.083	26	9	1E-06	70	365	9	70	1.44E-11	0.01	0.000000001	1.85E-12	0.051	9E-14
1,1,1-Trichloroethane	0.109	10	0.5	0.083	26	9	1E-06	70	365	9	70	4.60E-11	0.09	0.000000001	5.92E-12		
Trichloroethene	0.293	10	0.5	0.083	26	9	1E-06	70	365	9	70	1.24E-10			1.59E-11	0.011	
												TOTAL HAZARD INDEX =		0.0000	TOTAL CANCER RISK =		3E-13

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	10	0.5	0.083	26	9	1E-06	70	365	9	70	1.02E-10	0.01	0.000000010	1.31E-11	0.0061	8E-14
1,1-Dichloroethane	0.081	10	0.5	0.083	26	9	1E-06	70	365	9	70	3.42E-11	0.1	0.000000000	4.40E-12		0E+00
1,1-Dichloroethene	0.053	10	0.5	0.083	26	9	1E-06	70	365	9	70	2.24E-11	0.009	0.000000002	2.88E-12	0.6	2E-12
1,2-Dichloroethene	0.712	10	0.5	0.083	26	9	1E-06	70	365	9	70	3.01E-10	0.01	0.000000030	3.87E-11		0E+00
Tetrachloroethene	0.422	10	0.5	0.083	26	9	1E-06	70	365	9	70	1.78E-10	0.01	0.000000018	2.29E-11	0.051	1E-12
1,1,1-Trichloroethane	0.484	10	0.5	0.083	26	9	1E-06	70	365	9	70	2.04E-10	0.09	0.000000002	2.63E-11		
Trichloroethene	3.252	10	0.5	0.083	26	9	1E-06	70	365	9	70	1.37E-09			1.77E-10	0.011	
												TOTAL HAZARD INDEX =		0.000000	TOTAL CANCER RISK =		3E-12

TABLE D-3.10
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INGESTION EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSERS - ADULT

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	100	1	0.17	52	30	1E-06	70	365	30	70	3.11E-09	0.01	0.0000003114	1.33E-09	0.0061	8E-12
1,1-Dichloroethane	0.043	100	1	0.17	52	30	1E-06	70	365	30	70	1.49E-09	0.1	0.0000000149	6.38E-10		0E+00
1,1-Dichloroethene	0.005	100	1	0.17	52	30	1E-06	70	365	30	70	1.73E-10	0.009	0.0000000192	7.41E-11	0.6	4E-11
1,2-Dichloroethene	0.173	100	1	0.17	52	30	1E-06	70	365	30	70	5.99E-09	0.01	0.0000005986	2.57E-09		0E+00
Tetrachloroethene	0.132	100	1	0.17	52	30	1E-06	70	365	30	70	4.57E-09	0.01	0.0000004567	1.96E-09	0.051	1E-10
1,1,1-Trichloroethane	0.321	100	1	0.17	52	30	1E-06	70	365	30	70	1.11E-08	0.09	0.0000001234	4.76E-09		0E+00
Trichloroethene	1.251	100	1	0.17	52	30	1E-06	70	365	30	70	4.33E-08			1.85E-08	0.011	2E-10
												TOTAL HAZARD INDEX =		0.0000	TOTAL CANCER RISK =		4E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	100	1	0.17	52	30	1E-06	70	365	30	70	2.74E-08	0.01	0.00000274	1.17E-08	0.0061	7E-11
1,1-Dichloroethane	0.253	100	1	0.17	52	30	1E-06	70	365	30	70	8.75E-09	0.1	0.00000009	3.75E-09		0E+00
1,1-Dichloroethene	0.175	100	1	0.17	52	30	1E-06	70	365	30	70	6.05E-09	0.009	0.00000067	2.59E-09	0.6	2E-09
1,2-Dichloroethene	3.778	100	1	0.17	52	30	1E-06	70	365	30	70	1.31E-07	0.01	0.00001307	5.60E-08		0E+00
Tetrachloroethene	2.021	100	1	0.17	52	30	1E-06	70	365	30	70	6.99E-08	0.01	0.00000699	3.00E-08	0.051	2E-09
1,1,1-Trichloroethane	2.714	100	1	0.17	52	30	1E-06	70	365	30	70	9.39E-08	0.09	0.00000104	4.02E-08		0E+00
Trichloroethene	26.388	100	1	0.17	52	30	1E-06	70	365	30	70	9.13E-07			3.91E-07	0.011	4E-09
												TOTAL HAZARD INDEX =		0.000025	TOTAL CANCER RISK =		7E-09

TABLE D-3.11
CMW SITE - REASONABLE AVERAGE EXPOSURE
INGESTION EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSERS - CHILD

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	100	0.5	0.083	26	6	1E-06	15	365	6	70	5.52E-10	0.01	0.000000055	4.73E-11	0.0061	3E-13
1,1-Dichloroethane	0.018	100	0.5	0.083	26	6	1E-06	15	365	6	70	3.55E-10	0.1	0.000000004	3.04E-11		0E+00
1,1-Dichloroethene	0.005	100	0.5	0.083	26	6	1E-06	15	365	6	70	9.85E-11	0.009	0.000000011	8.45E-12	0.6	5E-12
1,2-Dichloroethene	0.047	100	0.5	0.083	26	6	1E-06	15	365	6	70	9.26E-10	0.01	0.000000093	7.94E-11		0E+00
Tetrachloroethene	0.034	100	0.5	0.083	26	6	1E-06	15	365	6	70	6.70E-10	0.01	0.000000067	5.74E-11	0.051	3E-12
1,1,1-Trichloroethane	0.109	100	0.5	0.083	26	6	1E-06	15	365	6	70	2.15E-09	0.09	0.000000024	1.84E-10		
Trichloroethene	0.293	100	0.5	0.083	26	6	1E-06	15	365	6	70	5.77E-09			4.95E-10	0.011	
												TOTAL HAZARD INDEX =		0.000	TOTAL CANCER RISK =		8E-12

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	100	0.5	0.083	26	6	1E-06	15	365	6	70	4.75E-09	0.01	0.000000475	4.07E-10	0.0061	2E-12
1,1-Dichloroethane	0.081	100	0.5	0.083	26	6	1E-06	15	365	6	70	1.60E-09	0.1	0.000000016	1.37E-10		0E+00
1,1-Dichloroethene	0.053	100	0.5	0.083	26	6	1E-06	15	365	6	70	1.04E-09	0.009	0.000000116	8.95E-11	0.6	5E-11
1,2-Dichloroethene	0.712	100	0.5	0.083	26	6	1E-06	15	365	6	70	1.40E-08	0.01	0.000001403	1.20E-09	-	0E+00
Tetrachloroethene	0.422	100	0.5	0.083	26	6	1E-06	15	365	6	70	8.32E-09	0.01	0.000000832	7.13E-10	0.051	4E-11
1,1,1-Trichloroethane	0.484	100	0.5	0.083	26	6	1E-06	15	365	6	70	9.54E-09	0.09	0.000000106	8.18E-10		
Trichloroethene	3.252	100	0.5	0.083	26	6	1E-06	15	365	6	70	6.41E-08			5.49E-09	0.011	
												TOTAL HAZARD INDEX =		0.0000	TOTAL CANCER RISK =		9E-11

TABLE D-3.12
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INGESTION EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSERS - CHILD

EQUATION: Intake = (CS x IR x FI x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Intake/RfD = HQ
Intake x SF = Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	200	1	0.17	52	6	1E-06	15	365	6	70	2.91E-08	0.01	0.000002906	2.49E-09	0.0061	2E-11
1,1-Dichloroethane	0.043	200	1	0.17	52	6	1E-06	15	365	6	70	1.39E-08	0.1	0.000000139	1.19E-09		0E+00
1,1-Dichloroethene	0.005	200	1	0.17	52	6	1E-06	15	365	6	70	1.61E-09	0.009	0.000000179	1.38E-10	0.6	8E-11
1,2-Dichloroethene	0.173	200	1	0.17	52	6	1E-06	15	365	6	70	5.59E-08	0.01	0.000005587	4.79E-09		0E+00
Tetrachloroethene	0.132	200	1	0.17	52	6	1E-06	15	365	6	70	4.26E-08	0.01	0.000004263	3.65E-09	0.051	2E-10
1,1,1-Trichloroethane	0.321	200	1	0.17	52	6	1E-06	15	365	6	70	1.04E-07	0.09	0.000001152	8.88E-09		0E+00
Trichloroethene	1.251	200	1	0.17	52	6	1E-06	15	365	6	70	4.04E-07			3.46E-08	0.011	4E-10
												TOTAL HAZARD INDEX =		0.000	TOTAL CANCER RISK =		7E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	IR (mg/day)	FI (unitless)	ET (dy/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	200	1	0.17	52	6	1E-06	15	365	6	70	2.56E-07	0.01	0.00002558	2.19E-08	0.0061	1E-10
1,1-Dichloroethane	0.253	200	1	0.17	52	6	1E-06	15	365	6	70	8.17E-08	0.1	0.00000082	7.00E-09		0E+00
1,1-Dichloroethene	0.175	200	1	0.17	52	6	1E-06	15	365	6	70	5.65E-08	0.009	0.00000628	4.84E-09	0.6	3E-09
1,2-Dichloroethene	3.778	200	1	0.17	52	6	1E-06	15	365	6	70	1.22E-06	0.01	0.00012200	1.05E-07		0E+00
Tetrachloroethene	2.021	200	1	0.17	52	6	1E-06	15	365	6	70	6.53E-07	0.01	0.00006526	5.59E-08	0.051	3E-09
1,1,1-Trichloroethane	2.714	200	1	0.17	52	6	1E-06	15	365	6	70	8.76E-07	0.09	0.00000974	7.51E-08		0E+00
Trichloroethene	26.388	200	1	0.17	52	6	1E-06	15	365	6	70	8.52E-06			7.30E-07	0.011	8E-09
												TOTAL HAZARD INDEX =		0.0002	TOTAL CANCER RISK =		1E-08

TABLE D-4.1
CMW SITE - REASONABLE AVERAGE EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - ADULT

EQUATIONS:

Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	3.01E-09	0.01	0.0000003	3.87E-10	0.0061	2.36E-12
1,1-Dichloroethane	0.018	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	1.94E-09	0.1	0.0000000	2.49E-10		0.00E+00
1,1-Dichloroethene	0.005	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	5.38E-10	0.009	0.0000001	6.92E-11	0.6	4.15E-11
1,2-Dichloroethene	0.047	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	5.06E-09	0.01	0.0000005	6.50E-10		0.00E+00
Tetrachloroethene	0.034	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	3.66E-09	0.01	0.0000004	4.71E-10	0.051	2.40E-11
1,1,1-Trichloroethane	0.109	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	1.17E-08	0.09	0.0000001	1.51E-09		0.00E+00
Trichloroethene	0.293	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	3.15E-08			4.05E-09	0.011	4.46E-11
													Hazard index =		0.000	Cancer Risk =		1.12E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	2.59E-08	0.01	0.000002594	3.34E-09	0.0061	2.03E-11
1,1-Dichloroethane	0.081	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	8.72E-09	0.1	0.000000087	1.12E-09		0
1,1-Dichloroethene	0.053	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	5.70E-09	0.009	0.000000634	7.33E-10	0.6	4.40E-10
1,2-Dichloroethene	0.712	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	7.66E-08	0.01	0.000007663	9.85E-09		0
Tetrachloroethene	0.422	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	4.54E-08	0.01	0.000004542	5.84E-09	0.051	2.98E-10
1,1,1-Trichloroethane	0.484	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	5.21E-08	0.09	0.000000579	6.70E-09		0
Trichloroethene	3.252	5000	0.2	0.01	1	275	9	1E-06	70	365	9	70	3.50E-07			4.50E-08	0.011	4.95E-10
													Hazard index =		0.0000	Cancer Risk =		1.25E-09

TABLE D-4.2
CMW SITE - REASONABLE MAXIMUM EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - ADULT

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	5800	1	0.01	1	350	30	1E-06	70	365	30	70	7.15E-08	0.01	0.0000072	3.06E-08	0.0061	2E-10
1,1-Dichloroethane	0.043	5800	1	0.01	1	350	30	1E-06	70	365	30	70	3.42E-08	0.1	0.0000003	1.46E-08		0E+00
1,1-Dichloroethene	0.005	5800	1	0.01	1	350	30	1E-06	70	365	30	70	3.97E-09	0.009	0.0000004	1.70E-09	0.6	1E-09
1,2-Dichloroethene	0.173	5800	1	0.01	1	350	30	1E-06	70	365	30	70	1.37E-07	0.01	0.0000137	5.89E-08		0E+00
Tetrachloroethene	0.132	5800	1	0.01	1	350	30	1E-06	70	365	30	70	1.05E-07	0.01	0.0000105	4.49E-08	0.051	2E-09
1,1,1-Trichloroethane	0.321	5800	1	0.01	1	350	30	1E-06	70	365	30	70	2.55E-07	0.09	0.0000028	1.09E-07		0E+00
Trichloroethene	1.251	5800	1	0.01	1	350	30	1E-06	70	365	30	70	9.94E-07			4.26E-07	0.011	5E-09
													Total Hazard index =		0.000	Cancer Risk =		8.19E-09

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	5800	1	0.01	1	350	30	1E-06	70	365	30	70	6.29E-07	0.01	0.000062926	2.70E-07	0.0061	1.65E-09
1,1-Dichloroethane	0.253	5800	1	0.01	1	350	30	1E-06	70	365	30	70	2.01E-07	0.1	0.000002010	8.61E-08		0
1,1-Dichloroethene	0.175	5800	1	0.01	1	350	30	1E-06	70	365	30	70	1.39E-07	0.009	0.000015449	5.96E-08	0.6	3.58E-08
1,2-Dichloroethene	3.778	5800	1	0.01	1	350	30	1E-06	70	365	30	70	3.00E-06	0.01	0.000300170	1.29E-06		0
Tetrachloroethene	2.021	5800	1	0.01	1	350	30	1E-06	70	365	30	70	1.61E-06	0.01	0.000160573	6.88E-07	0.051	3.51E-08
1,1,1-Trichloroethane	2.714	5800	1	0.01	1	350	30	1E-06	70	365	30	70	2.16E-06	0.09	0.000023959	9.24E-07		0
Trichloroethene	26.388	5800	1	0.01	1	350	30	1E-06	70	365	30	70	2.10E-05			8.99E-06	0.011	9.88E-08
													Total Hazard index =		0.0006	Cancer Risk =		1.71E-07

TABLE D-4.3
CMW SITE - REASONABLE AVERAGE EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - CHILD

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	5.57E-09	0.01	0.0000006	4.77E-10	0.0061	2.91E-12
1,1-Dichloroethane	0.018	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	3.58E-09	0.1	0.0000000	3.07E-10		0.00E+00
1,1-Dichloroethene	0.005	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	9.95E-10	0.009	0.0000001	8.52E-11	0.6	5.11E-11
1,2-Dichloroethene	0.047	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	9.35E-09	0.01	0.0000009	8.01E-10		0.00E+00
Tetrachloroethene	0.034	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	6.76E-09	0.01	0.0000007	5.80E-10	0.051	2.96E-11
1,1,1-Trichloroethane	0.109	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	2.17E-08	0.09	0.0000002	1.86E-09		0.00E+00
Trichloroethene	0.293	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	5.83E-08			5.00E-09	0.011	5.49E-11
													Hazard Index =		0.000	Cancer Risk =		1.39E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	4.79E-08	0.01	0.000004794	4.11E-09	0.0061	2.51E-11
1,1-Dichloroethane	0.081	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	1.61E-08	0.1	0.000000161	1.38E-09		0
1,1-Dichloroethene	0.053	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	1.05E-08	0.009	0.000001171	9.04E-10	0.6	5.42E-10
1,2-Dichloroethene	0.712	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	1.42E-07	0.01	0.000014162	1.21E-08		0
Tetrachloroethene	0.422	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	8.39E-08	0.01	0.000008394	7.19E-09	0.051	3.67E-10
1,1,1-Trichloroethane	0.484	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	9.63E-08	0.09	0.000001070	8.25E-09		0
Trichloroethene	3.252	1980	0.2	0.01	1	275	6	1E-06	15	365	6	70	6.47E-07			5.54E-08	0.011	6.10E-10
													Hazard Index =		0.0000	Cancer Risk =		1.54E-09

TABLE D-4.4
CMW SITE - REASONABLE MAXIMUM EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE ON-SITE RESIDENT - CHILD

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	2295	1	0.01	1	350	6	1E-06	15	365	6	70	1.32E-07	0.01	0.0000132	1.13E-08	0.0061	7E-11
1,1-Dichloroethane	0.043	2295	1	0.01	1	350	6	1E-06	15	365	6	70	6.31E-08	0.1	0.0000006	5.41E-09		0E+00
1,1-Dichloroethene	0.005	2295	1	0.01	1	350	6	1E-06	15	365	6	70	7.34E-09	0.009	0.0000008	6.29E-10	0.6	4E-10
1,2-Dichloroethene	0.173	2295	1	0.01	1	350	6	1E-06	15	365	6	70	2.54E-07	0.01	0.0000254	2.18E-08		0E+00
Tetrachloroethene	0.132	2295	1	0.01	1	350	6	1E-06	15	365	6	70	1.94E-07	0.01	0.0000194	1.66E-08	0.051	8E-10
1,1,1-Trichloroethane	0.321	2295	1	0.01	1	350	6	1E-06	15	365	6	70	4.71E-07	0.09	0.0000052	4.04E-08		0E+00
Trichloroethene	1.251	2295	1	0.01	1	350	6	1E-06	15	365	6	70	1.84E-06			1.57E-07	0.011	2E-09

Total Hazard Index = 0.000 Cancer Risk = 3.02E-09

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	2295	1	0.01	1	350	6	1E-06	15	365	6	70	1.16E-06	0.01	0.000116196	9.96E-08	0.0061	6.08E-10
1,1-Dichloroethane	0.253	2295	1	0.01	1	350	6	1E-06	15	365	6	70	3.71E-07	0.1	0.000003712	3.18E-08		0
1,1-Dichloroethene	0.175	2295	1	0.01	1	350	6	1E-06	15	365	6	70	2.57E-07	0.009	0.000028527	2.20E-08	0.6	1.32E-08
1,2-Dichloroethene	3.778	2295	1	0.01	1	350	6	1E-06	15	365	6	70	5.54E-06	0.01	0.000554279	4.75E-07		0
Tetrachloroethene	2.021	2295	1	0.01	1	350	6	1E-06	15	365	6	70	2.97E-06	0.01	0.000296506	2.54E-07	0.051	1.30E-08
1,1,1-Trichloroethane	2.714	2295	1	0.01	1	350	6	1E-06	15	365	6	70	3.98E-06	0.09	0.000044242	3.41E-07		0
Trichloroethene	26.388	2295	1	0.01	1	350	6	1E-06	15	365	6	70	3.87E-05			3.32E-06	0.011	3.65E-08

Total Hazard Index = 0.0010 Cancer Risk = 6.33E-08

TABLE D-4.5
CMW SITE - REASONABLE AVERAGE EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE CONSTRUCTION WORKER - ADULT

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	6.58E-10	0.01	0.0000001	9.39E-12	0.0061	5.73E-14
1,1-Dichloroethane	0.018	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	4.23E-10	0.1	0.0000000	6.04E-12		0.00E+00
1,1-Dichloroethene	0.005	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	1.17E-10	0.009	0.0000000	1.68E-12	0.6	1.01E-12
1,2-Dichloroethene	0.047	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	1.10E-09	0.01	0.0000001	1.58E-11		0.00E+00
Tetrachloroethene	0.034	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	7.98E-10	0.01	0.0000001	1.14E-11	0.051	5.82E-13
1,1,1-Trichloroethane	0.109	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	2.56E-09	0.09	0.0000000	3.66E-11		0.00E+00
Trichloroethene	0.293	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	6.88E-09			9.83E-11	0.011	1.08E-12
													Hazard index =		0.0000	Cancer Risk =		2.73E-12

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	5.66E-09	0.01	0.000000566	8.08E-11	0.0061	4.93E-13
1,1-Dichloroethane	0.081	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	1.90E-09	0.1	0.000000019	2.72E-11		0
1,1-Dichloroethene	0.053	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	1.24E-09	0.009	0.000000138	1.78E-11	0.6	1.07E-11
1,2-Dichloroethene	0.712	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	1.67E-08	0.01	0.000001672	2.39E-10		0
Tetrachloroethene	0.422	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	9.91E-09	0.01	0.000000991	1.42E-10	0.051	7.22E-12
1,1,1-Trichloroethane	0.484	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	1.14E-08	0.09	0.000000126	1.62E-10		0
Trichloroethene	3.252	5000	0.2	0.01	1	60	1	1E-06	70	365	1	70	7.64E-08			1.09E-09	0.011	1.20E-11
													Hazard index =		0.00000	Cancer Risk =		3.04E-11

TABLE D-4.6
CMW SITE - REASONABLE MAXIMUM EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE CONSTRUCTION WORKER - ADULT

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	5800	1	0.01	1	130	2	1E-06	70	365	2	70	2.66E-08	0.01	0.0000027	7.59E-10	0.0061	5E-12
1,1-Dichloroethane	0.043	5800	1	0.01	1	130	2	1E-06	70	365	2	70	1.27E-08	0.1	0.0000001	3.63E-10		0E+00
1,1-Dichloroethene	0.005	5800	1	0.01	1	130	2	1E-06	70	365	2	70	1.48E-09	0.009	0.0000002	4.22E-11	0.6	3E-11
1,2-Dichloroethene	0.173	5800	1	0.01	1	130	2	1E-06	70	365	2	70	5.11E-08	0.01	0.0000051	1.46E-09		0E+00
Tetrachloroethene	0.132	5800	1	0.01	1	130	2	1E-06	70	365	2	70	3.90E-08	0.01	0.0000039	1.11E-09	0.051	6E-11
1,1,1-Trichloroethane	0.321	5800	1	0.01	1	130	2	1E-06	70	365	2	70	9.47E-08	0.09	0.0000011	2.71E-09		0E+00
Trichloroethene	1.251	5800	1	0.01	1	130	2	1E-06	70	365	2	70	3.69E-07			1.05E-08	0.011	1E-10
													Total Hazard index =		0.0000	Cancer Risk =		2.03E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	5800	1	0.01	1	130	2	1E-06	70	365	2	70	2.34E-07	0.01	0.000023373	6.68E-09	0.0061	4.07E-11
1,1-Dichloroethane	0.253	5800	1	0.01	1	130	2	1E-06	70	365	2	70	7.47E-08	0.1	0.000000747	2.13E-09		0
1,1-Dichloroethene	0.175	5800	1	0.01	1	130	2	1E-06	70	365	2	70	5.16E-08	0.009	0.000005738	1.48E-09	0.6	8.85E-10
1,2-Dichloroethene	3.778	5800	1	0.01	1	130	2	1E-06	70	365	2	70	1.11E-06	0.01	0.000111492	3.19E-08		0
Tetrachloroethene	2.021	5800	1	0.01	1	130	2	1E-06	70	365	2	70	5.96E-07	0.01	0.000059641	1.70E-08	0.051	8.69E-10
1,1,1-Trichloroethane	2.714	5800	1	0.01	1	130	2	1E-06	70	365	2	70	8.01E-07	0.09	0.000008899	2.29E-08		0
Trichloroethene	26.388	5800	1	0.01	1	130	2	1E-06	70	365	2	70	7.79E-06			2.22E-07	0.011	2.45E-09
													Total Hazard index =		0.00021	Cancer Risk =		4.24E-09

TABLE D-4.7
CMW SITE - REASONABLE AVERAGE EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE ON-SITE WORKER - ADULT

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	2.74E-09	0.01	0.0000003	3.52E-10	0.0061	2.15E-12
1,1-Dichloroethane	0.018	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	1.76E-09	0.1	0.0000000	2.26E-10		0.00E+00
1,1-Dichloroethene	0.005	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	4.89E-10	0.009	0.0000001	6.29E-11	0.6	3.77E-11
1,2-Dichloroethene	0.047	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	4.60E-09	0.01	0.0000005	5.91E-10		0.00E+00
Tetrachloroethene	0.034	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	3.33E-09	0.01	0.0000003	4.28E-10	0.051	2.18E-11
1,1,1-Trichloroethane	0.109	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	1.07E-08	0.09	0.0000001	1.37E-09		0.00E+00
Trichloroethene	0.293	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	2.87E-08			3.69E-09	0.011	4.05E-11
													Hazard Index =		0.000	Cancer Risk =		1.02E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	2.36E-08	0.01	0.000002358	3.03E-09	0.0061	1.85E-11
1,1-Dichloroethane	0.081	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	7.93E-09	0.1	0.000000079	1.02E-09		0
1,1-Dichloroethene	0.053	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	5.19E-09	0.009	0.000000576	6.67E-10	0.6	4.00E-10
1,2-Dichloroethene	0.712	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	6.97E-08	0.01	0.000006967	8.96E-09		0
Tetrachloroethene	0.422	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	4.13E-08	0.01	0.000004129	5.31E-09	0.051	2.71E-10
1,1,1-Trichloroethane	0.484	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	4.74E-08	0.09	0.000000526	6.09E-09		0
Trichloroethene	3.252	5000	0.2	0.01	1	250	9	1E-06	70	365	9	70	3.18E-07			4.09E-08	0.011	4.50E-10
													Hazard Index =		0.0000	Cancer Risk =		1.14E-09

TABLE D-4.8
CMW SITE - REASONABLE MAXIMUM EXPOSURE
DERMAL EXPOSURE TO SOILS
FUTURE ON-SITE WORKER - ADULT

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	5800	1	0.01	1	250	25	1E-06	70	365	25	70	5.11E-08	0.01	0.0000051	1.82E-08	0.0061	1E-10
1,1-Dichloroethane	0.043	5800	1	0.01	1	250	25	1E-06	70	365	25	70	2.44E-08	0.1	0.0000002	8.72E-09		0E+00
1,1-Dichloroethene	0.005	5800	1	0.01	1	250	25	1E-06	70	365	25	70	2.84E-09	0.009	0.0000003	1.01E-09	0.6	6E-10
1,2-Dichloroethene	0.173	5800	1	0.01	1	250	25	1E-06	70	365	25	70	9.82E-08	0.01	0.0000098	3.51E-08		0E+00
Tetrachloroethene	0.132	5800	1	0.01	1	250	25	1E-06	70	365	25	70	7.49E-08	0.01	0.0000075	2.68E-08	0.051	1E-09
1,1,1-Trichloroethane	0.321	5800	1	0.01	1	250	25	1E-06	70	365	25	70	1.82E-07	0.09	0.0000020	6.51E-08		0E+00
Trichloroethene	1.251	5800	1	0.01	1	250	25	1E-06	70	365	25	70	7.10E-07			2.54E-07	0.011	3E-09
													Total Hazard Index =		0.000	Cancer Risk =		4.87E-09

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	5800	1	0.01	1	250	25	1E-06	70	365	25	70	4.49E-07	0.01	0.000044947	1.61E-07	0.0061	9.79E-10
1,1-Dichloroethane	0.253	5800	1	0.01	1	250	25	1E-06	70	365	25	70	1.44E-07	0.1	0.000001436	5.13E-08		0
1,1-Dichloroethene	0.175	5800	1	0.01	1	250	25	1E-06	70	365	25	70	9.93E-08	0.009	0.000011035	3.55E-08	0.6	2.13E-08
1,2-Dichloroethene	3.778	5800	1	0.01	1	250	25	1E-06	70	365	25	70	2.14E-06	0.01	0.000214407	7.66E-07		0
Tetrachloroethene	2.021	5800	1	0.01	1	250	25	1E-06	70	365	25	70	1.15E-06	0.01	0.000114695	4.10E-07	0.051	2.09E-08
1,1,1-Trichloroethane	2.714	5800	1	0.01	1	250	25	1E-06	70	365	25	70	1.54E-06	0.09	0.000017114	6.50E-07		0
Trichloroethene	26.388	5800	1	0.01	1	250	25	1E-06	70	365	25	70	1.50E-05			5.35E-06	0.011	5.88E-08
													Total Hazard Index =		0.0004	Cancer Risk =		1.02E-07

TABLE D-4.9
CMW SITE - REASONABLE AVERAGE EXPOSURE
DERMAL EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSER - ADULT

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	2.85E-10	0.01	0.0000000	3.66E-11	0.0061	2.23E-13
1,1-Dichloroethane	0.018	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	1.83E-10	0.1	0.0000000	2.36E-11		0.00E+00
1,1-Dichloroethene	0.005	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	5.09E-11	0.009	0.0000000	6.54E-12	0.6	3.93E-12
1,2-Dichloroethene	0.047	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	4.78E-10	0.01	0.0000000	6.15E-11		0.00E+00
Tetrachloroethene	0.034	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	3.46E-10	0.01	0.0000000	4.45E-11	0.051	2.27E-12
1,1,1-Trichloroethane	0.109	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	1.11E-09	0.09	0.0000000	1.43E-10		0.00E+00
Trichloroethene	0.293	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	2.98E-09			3.83E-10	0.011	4.22E-12
													Hazard index =		0.0000	Cancer Risk =		1.06E-11

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	2.45E-09	0.01	0.000000245	3.15E-10	0.0061	1.92E-12
1,1-Dichloroethane	0.081	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	8.24E-10	0.1	0.000000008	1.06E-10		0
1,1-Dichloroethene	0.053	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	5.39E-10	0.009	0.000000060	6.93E-11	0.6	4.16E-11
1,2-Dichloroethene	0.712	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	7.25E-09	0.01	0.000000725	9.32E-10		0
Tetrachloroethene	0.422	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	4.29E-09	0.01	0.000000429	5.52E-10	0.051	2.82E-11
1,1,1-Trichloroethane	0.484	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	4.93E-09	0.09	0.000000055	6.33E-10		0
Trichloroethene	3.252	5000	0.2	0.01	1	26	9	1E-06	70	365	9	70	3.31E-08			4.25E-09	0.011	4.68E-11
													Hazard index =		0.00000	Cancer Risk =		1.18E-10

TABLE D-4.10
CMW SITE - REASONABLE MAXIMUM EXPOSURE
DERMAL EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSER - ADULT

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	5800	1	0.01	1	52	30	1E-06	70	365	30	70	1.06E-08	0.01	0.0000011	4.55E-09	0.0061	3E-11
1,1-Dichloroethane	0.043	5800	1	0.01	1	52	30	1E-06	70	365	30	70	5.08E-09	0.1	0.0000001	2.18E-09		0E+00
1,1-Dichloroethene	0.005	5800	1	0.01	1	52	30	1E-06	70	365	30	70	5.90E-10	0.009	0.0000001	2.53E-10	0.6	2E-10
1,2-Dichloroethene	0.173	5800	1	0.01	1	52	30	1E-06	70	365	30	70	2.04E-08	0.01	0.0000020	8.75E-09		0E+00
Tetrachloroethene	0.132	5800	1	0.01	1	52	30	1E-06	70	365	30	70	1.56E-08	0.01	0.0000016	6.68E-09	0.051	3E-10
1 1,1-Trichloroethane	0.321	5800	1	0.01	1	52	30	1E-06	70	365	30	70	3.79E-08	0.09	0.0000004	1.62E-08		0E+00
Trichloroethene	1.251	5800	1	0.01	1	52	30	1E-06	70	365	30	70	1.48E-07			6.33E-08	0.011	7E-10
													Total Hazard Index =		0.0000	Cancer Risk =		1.22E-09

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	5800	1	0.01	1	52	30	1E-06	70	365	30	70	9.35E-08	0.01	0.000009349	4.01E-08	0.0061	2.44E-10
1,1-Dichloroethane	0.253	5800	1	0.01	1	52	30	1E-06	70	365	30	70	2.99E-08	0.1	0.000000299	1.28E-08		0
1,1-Dichloroethene	0.175	5800	1	0.01	1	52	30	1E-06	70	365	30	70	2.07E-08	0.009	0.000002295	8.85E-09	0.6	5.31E-09
1,2-Dichloroethene	3.778	5800	1	0.01	1	52	30	1E-06	70	365	30	70	4.46E-07	0.01	0.000044597	1.91E-07		0
Tetrachloroethene	2.021	5800	1	0.01	1	52	30	1E-06	70	365	30	70	2.39E-07	0.01	0.000023857	1.02E-07	0.051	5.21E-09
1,1,1-Trichloroethane	2.714	5800	1	0.01	1	52	30	1E-06	70	365	30	70	3.20E-07	0.09	0.000003560	1.37E-07		0
Trichloroethene	26.388	5800	1	0.01	1	52	30	1E-06	70	365	30	70	3.11E-06			1.33E-06	0.011	1.47E-08
													Total Hazard Index =		0.00008	Cancer Risk =		2.55E-08

TABLE D-4.11
CMW SITE - REASONABLE AVERAGE EXPOSURE
DERMAL EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSER - CHILD

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.028	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	5.27E-10	0.01	0.0000001	4.51E-11	0.0061	2.75E-13
1,1-Dichloroethane	0.018	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	3.38E-10	0.1	0.0000000	2.90E-11		0.00E+00
1,1-Dichloroethene	0.005	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	9.40E-11	0.009	0.0000000	8.06E-12	0.6	4.84E-12
1,2-Dichloroethene	0.047	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	8.84E-10	0.01	0.0000001	7.58E-11		0.00E+00
Tetrachloroethene	0.034	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	6.39E-10	0.01	0.0000001	5.48E-11	0.051	2.80E-12
1,1,1-Trichloroethane	0.109	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	2.05E-09	0.09	0.0000000	1.76E-10		0.00E+00
Trichloroethene	0.293	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	5.51E-09			4.72E-10	0.011	5.20E-12
													Hazard index =		0.0000	Cancer Risk =		1.31E-11

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.241	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	4.53E-09	0.01	0.000000453	3.88E-10	0.0061	2.37E-12
1,1-Dichloroethane	0.081	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	1.52E-09	0.1	0.000000015	1.31E-10		0
1,1-Dichloroethene	0.053	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	9.97E-10	0.009	0.000000111	8.54E-11	0.6	5.13E-11
1,2-Dichloroethene	0.712	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	1.34E-08	0.01	0.000001339	1.15E-09		0
Tetrachloroethene	0.422	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	7.94E-09	0.01	0.000000794	6.80E-10	0.051	3.47E-11
1,1,1-Trichloroethane	0.484	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	9.10E-09	0.09	0.000000101	7.80E-10		0
Trichloroethene	3.252	1980	0.2	0.01	1	26	6	1E-06	15	365	6	70	6.12E-08			5.24E-09	0.011	5.77E-11
													Hazard Index =		0.00000	Cancer Risk =		1.46E-10

TABLE D-4.12
CMW SITE - REASONABLE MAXIMUM EXPOSURE
DERMAL EXPOSURE TO SOILS
CURRENT AND FUTURE TRESPASSER - CHILD

EQUATIONS:
Absorbed Dose = (CS x SA x AF x ABS x ET x EF x ED x CF) / (BW x AT1 x AT2 or AT3)
Absorbed Dose/RfD = HQ
Absorbed Dose x SF = Cancer Risk

STOCK PILED SOIL

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.090	2295	1	0.01	1	52	6	1E-06	15	365	6	70	1.96E-08	0.01	0.0000020	1.68E-09	0.0061	1E-11
1,1-Dichloroethane	0.043	2295	1	0.01	1	52	6	1E-06	15	365	6	70	9.37E-09	0.1	0.0000001	8.03E-10		0E+00
1,1-Dichloroethene	0.005	2295	1	0.01	1	52	6	1E-06	15	365	6	70	1.09E-09	0.009	0.0000001	9.34E-11	0.6	6E-11
1,2-Dichloroethene	0.173	2295	1	0.01	1	52	6	1E-06	15	365	6	70	3.77E-08	0.01	0.0000038	3.23E-09		0E+00
Tetrachloroethene	0.132	2295	1	0.01	1	52	6	1E-06	15	365	6	70	2.88E-08	0.01	0.0000029	2.47E-09	0.051	1E-10
1,1,1-Trichloroethane	0.321	2295	1	0.01	1	52	6	1E-06	15	365	6	70	7.00E-08	0.09	0.0000008	6.00E-09		0E+00
Trichloroethene	1.251	2295	1	0.01	1	52	6	1E-06	15	365	6	70	2.73E-07			2.34E-08	0.011	3E-10
													Total Hazard index =		0.0000	Cancer Risk =		4.49E-10

SOIL DURING EXCAVATION

CHEMICAL	CS (mg/kg)	SA (sqcm/event)	AF (mg/sqcm)	ABS (unitless)	ET (events/dy)	EF (dy/yr)	ED (yr)	CF (kg/mg)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	INTAKE (mg/kg-dy)	RFDo (mg/kg-dy)	HQ (unitless)	Intake (mg/kg-dy)	SF (mg/kg-d)^-1	RISK
Chloroform	0.792	2295	1	0.01	1	52	6	1E-06	15	365	6	70	1.73E-07	0.01	0.000017263	1.48E-08	0.0061	9.03E-11
1,1-Dichloroethane	0.253	2295	1	0.01	1	52	6	1E-06	15	365	6	70	5.51E-08	0.1	0.000000551	4.73E-09		0
1,1-Dichloroethene	0.175	2295	1	0.01	1	52	6	1E-06	15	365	6	70	3.81E-08	0.009	0.000004238	3.27E-09	0.6	1.96E-09
1,2-Dichloroethene	3.778	2295	1	0.01	1	52	6	1E-06	15	365	6	70	8.24E-07	0.01	0.000082350	7.06E-08		0
Tetrachloroethene	2.021	2295	1	0.01	1	52	6	1E-06	15	365	6	70	4.41E-07	0.01	0.000044052	3.78E-08	0.051	1.93E-09
1,1,1-Trichloroethane	2.714	2295	1	0.01	1	52	6	1E-06	15	365	6	70	5.92E-07	0.09	0.000006573	5.07E-08		0
Trichloroethene	26.388	2295	1	0.01	1	52	6	1E-06	15	365	6	70	5.75E-06			4.93E-07	0.011	5.42E-09
													Total Hazard Index =		0.00016	Cancer Risk =		9.40E-09

TABLE D-5.1
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
FUTURE ON-SITE RESIDENTS - ADULT

Equation: Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	0.83	4	350	30	70	365	30	70	2.48E-17			1.06E-17	0.081	9E-19
1,1-Dichloroethane	2.97E-16	0.83	4	350	30	70	365	30	70	1.35E-17	0.1	1.35E-16	5.79E-18		0E+00
1,1-Dichloroethene	1.13E-16	0.83	4	350	30	70	365	30	70	5.14E-18			2.20E-18	1.2	3E-18
1,2-Dichloroethene	2.12E-15	0.83	4	350	30	70	365	30	70	9.64E-17			4.13E-17		0E+00
Tetrachloroethene	1.05E-16	0.83	4	350	30	70	365	30	70	4.78E-18			2.05E-18	1.30E-03	3E-21
1,1,1-Trichloroethane	1.64E-15	0.83	4	350	30	70	365	30	70	7.46E-17	0.3	2.49E-16	3.20E-17		0E+00
Trichloroethene	2.99E-15	0.83	4	350	30	70	365	30	70	1.36E-16			5.83E-17	0.017	1E-18
										Hazard Index =		0.00000	Cancer Risk =		4.50E-18

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	0.83	4	350	30	70	365	30	70	5.18E-10			2.22E-10	0.081	2E-11
1,1-Dichloroethane	5.45E-09	0.83	4	350	30	70	365	30	70	2.48E-10	0.1	2.48E-09	1.06E-10		0E+00
1,1-Dichloroethene	6.34E-10	0.83	4	350	30	70	365	30	70	2.88E-11			1.24E-11	1.2	1E-11
1,2-Dichloroethene	2.19E-08	0.83	4	350	30	70	365	30	70	9.96E-10			4.27E-10		0E+00
Tetrachloroethene	1.67E-08	0.83	4	350	30	70	365	30	70	7.60E-10			3.26E-10	1.30E-03	4E-13
1,1,1-Trichloroethane	4.07E-08	0.83	4	350	30	70	365	30	70	1.85E-09	0.3	6.17E-09	7.93E-10		0E+00
Trichloroethene	1.59E-07	0.83	4	350	30	70	365	30	70	7.23E-09			3.10E-09	0.017	5E-11
										TOTAL HAZARD INDEX =		0.00000	TOTAL CANCER RISK =		8.59E-11

TABLE D-5.1, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.7	2	275	9	70	365	9	70	7.23E-17			9.30E-18	0.081	8E-19
1,1-Dichloroethane	1.75E-15	0.7	2	275	9	70	365	9	70	2.64E-17	0.1	2.64E-16	3.39E-18		0E+00
1,1-Dichloroethene	3.96E-15	0.7	2	275	9	70	365	9	70	5.97E-17			7.67E-18	1.2	9E-18
1,2-Dichloroethene	4.62E-14	0.7	2	275	9	70	365	9	70	6.96E-16			8.95E-17		0E+00
Tetrachloroethene	1.60E-15	0.7	2	275	9	70	365	9	70	2.41E-17			3.10E-18	1.30E-03	4E-21
1,1,1-Trichloroethane	1.39E-14	0.7	2	275	9	70	365	9	70	2.09E-16	0.3	6.98E-16	2.69E-17		0E+00
Trichloroethene	6.32E-14	0.7	2	275	9	70	365	9	70	9.52E-16			1.22E-16	0.017	2E-18
										Hazard Index =		0.00000	Cancer Risk =		1.20E-17

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.7	2	275	9	70	365	9	70	1.51E-09			1.94E-10	0.081	2E-11
1,1-Dichloroethane	3.21E-08	0.7	2	275	9	70	365	9	70	4.84E-10	0.1	4.84E-09	6.22E-11		0E+00
1,1-Dichloroethene	2.22E-08	0.7	2	275	9	70	365	9	70	3.35E-10			4.30E-11	1.2	5E-11
1,2-Dichloroethene	4.79E-07	0.7	2	275	9	70	365	9	70	7.22E-09			9.28E-10		0E+00
Tetrachloroethene	2.56E-07	0.7	2	275	9	70	365	9	70	3.86E-09			4.96E-10	1.30E-03	6E-13
1,1,1-Trichloroethane	3.44E-07	0.7	2	275	9	70	365	9	70	5.18E-09	0.3	1.73E-08	6.66E-10		0E+00
Trichloroethene	3.35E-06	0.7	2	275	9	70	365	9	70	5.05E-08			6.49E-09	0.017	1E-10
										Hazard Index =		0.00000	Cancer Risk =		1.78E-10

TABLE D-5.2
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
FUTURE ON-SITE RESIDENTS - CHILD

Equation: Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	0.8	4	350	6	15	365	6	70	1.11E-16			9.56E-18	0.081	8E-19
1,1-Dichloroethane	2.97E-16	0.8	4	350	6	15	365	6	70	6.08E-17	0.1	6.08E-16	5.21E-18		0E+00
1,1-Dichloroethene	1.13E-16	0.8	4	350	6	15	365	6	70	2.31E-17			1.98E-18	1.2	2E-18
1,2-Dichloroethene	2.12E-15	0.8	4	350	6	15	365	6	70	4.34E-16			3.72E-17		0E+00
Tetrachloroethene	1.05E-16	0.8	4	350	6	15	365	6	70	2.15E-17			1.84E-18	1.30E-03	2E-21
1,1,1-Trichloroethane	1.64E-15	0.8	4	350	6	15	365	6	70	3.35E-16	0.3	1.12E-15	2.88E-17		0E+00
Trichloroethene	2.99E-15	0.8	4	350	6	15	365	6	70	6.12E-16			5.24E-17	0.017	9E-19
										Hazard Index =		0.00000	Cancer Risk =		4.05E-18

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	0.8	4	350	6	15	365	6	70	2.33E-09			2.00E-10	0.081	2E-11
1,1-Dichloroethane	5.45E-09	0.8	4	350	6	15	365	6	70	1.11E-09	0.1	1.11E-08	9.56E-11		0E+00
1,1-Dichloroethene	6.34E-10	0.8	4	350	6	15	365	6	70	1.30E-10			1.11E-11	1.2	1E-11
1,2-Dichloroethene	2.19E-08	0.8	4	350	6	15	365	6	70	4.48E-09			3.84E-10		0E+00
Tetrachloroethene	1.67E-08	0.8	4	350	6	15	365	6	70	3.42E-09			2.93E-10	1.30E-03	4E-13
1,1,1-Trichloroethane	4.07E-08	0.8	4	350	6	15	365	6	70	8.33E-09	0.3	2.78E-08	7.14E-10		0E+00
Trichloroethene	1.59E-07	0.8	4	350	6	15	365	6	70	3.25E-08			2.79E-09	0.017	5E-11
										TOTAL HAZARD INDEX =		0.00000	TOTAL CANCER RISK =		7.73E-11

TABLE D-5.2, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.4	2	275	6	15	365	6	70	1.93E-16			1.65E-17	0.081	1E-18
1,1-Dichloroethane	1.75E-15	0.4	2	275	6	15	365	6	70	7.03E-17	0.1	7.03E-16	6.03E-18		0E+00
1,1-Dichloroethene	3.96E-15	0.4	2	275	6	15	365	6	70	1.59E-16			1.36E-17	1.2	2E-17
1,2-Dichloroethene	4.62E-14	0.4	2	275	6	15	365	6	70	1.86E-15			1.59E-16		0E+00
Tetrachloroethene	1.60E-15	0.4	2	275	6	15	365	6	70	6.43E-17			5.51E-18	1.30E-03	7E-21
1,1,1-Trichloroethane	1.39E-14	0.4	2	275	6	15	365	6	70	5.59E-16	0.3	1.86E-15	4.79E-17		0E+00
Trichloroethene	6.32E-14	0.4	2	275	6	15	365	6	70	2.54E-15			2.18E-16	0.017	4E-18
										Hazard Index =		0.00000	Cancer Risk =		2.14E-17

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.4	2	275	6	15	365	6	70	4.02E-09			3.44E-10	0.081	3E-11
1,1-Dichloroethane	3.21E-08	0.4	2	275	6	15	365	6	70	1.29E-09	0.1	1.29E-08	1.11E-10		0E+00
1,1-Dichloroethene	2.22E-08	0.4	2	275	6	15	365	6	70	8.92E-10			7.65E-11	1.2	9E-11
1,2-Dichloroethene	4.79E-07	0.4	2	275	6	15	365	6	70	1.92E-08			1.65E-09		0E+00
Tetrachloroethene	2.56E-07	0.4	2	275	6	15	365	6	70	1.03E-08			8.82E-10	1.30E-03	1E-12
1,1,1-Trichloroethane	3.44E-07	0.4	2	275	6	15	365	6	70	1.38E-08	0.3	4.61E-08	1.18E-09		0E+00
Trichloroethene	3.35E-06	0.4	2	275	6	15	365	6	70	1.35E-07			1.15E-08	0.017	2E-10
										Hazard Index =		0.00000	Cancer Risk =		3.17E-10

TABLE D-5.3
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
FUTURE CONSTRUCTION WORKERS

Equation: Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL
Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	2.5	8	130	2	70	365	2	70	5.55E-17			1.58E-18	0.081	1E-19
1,1-Dichloroethane	2.97E-16	2.5	8	130	2	70	365	2	70	3.02E-17	0.1	3.02E-16	8.64E-19		0E+00
1,1-Dichloroethene	1.13E-16	2.5	8	130	2	70	365	2	70	1.15E-17			3.29E-19	1.2	4E-19
1,2-Dichloroethene	2.12E-15	2.5	8	130	2	70	365	2	70	2.16E-16			6.16E-18		0E+00
Tetrachloroethene	1.05E-16	2.5	8	130	2	70	365	2	70	1.07E-17			3.05E-19	1.30E-03	4E-22
1,1,1-Trichloroethane	1.64E-15	2.5	8	130	2	70	365	2	70	1.67E-16	0.3	5.56E-16	4.77E-18		0E+00
Trichloroethene	2.99E-15	2.5	8	130	2	70	365	2	70	3.04E-16			8.69E-18	0.017	1E-19
										Hazard Index =		8.59E-16	Cancer Risk =		7E-19

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	2.5	8	130	2	70	365	2	70	1.16E-09			3.31E-11	0.081	3E-12
1,1-Dichloroethane	5.45E-09	2.5	8	130	2	70	365	2	70	5.55E-10	0.1	5.55E-09	1.58E-11		0E+00
1,1-Dichloroethene	6.34E-10	2.5	8	130	2	70	365	2	70	6.45E-11			1.84E-12	1.2	2E-12
1,2-Dichloroethene	2.19E-08	2.5	8	130	2	70	365	2	70	2.23E-09			6.37E-11		0E+00
Tetrachloroethene	1.67E-08	2.5	8	130	2	70	365	2	70	1.70E-09			4.86E-11	1.30E-03	6E-14
1,1,1-Trichloroethane	4.07E-08	2.5	8	130	2	70	365	2	70	4.14E-09	0.3	1.38E-08	1.18E-10		0E+00
Trichloroethene	1.59E-07	2.5	8	130	2	70	365	2	70	1.62E-08			4.62E-10	0.017	8E-12
										TOTAL HAZARD INDEX =		1.94E-08	TOTAL CANCER RISK =		1E-11

TABLE D-5.3, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.83	4	60	1	70	365	1	70	3.74E-17			5.35E-19	0.081	4E-20
1,1-Dichloroethane	1.75E-15	0.83	4	60	1	70	365	1	70	1.36E-17	0.1	1.36E-16	1.95E-19		0E+00
1,1-Dichloroethene	3.96E-15	0.83	4	60	1	70	365	1	70	3.09E-17			4.41E-19	1.2	5E-19
1,2-Dichloroethene	4.62E-14	0.83	4	60	1	70	365	1	70	3.60E-16			5.15E-18		0E+00
Tetrachloroethene	1.60E-15	0.83	4	60	1	70	365	1	70	1.25E-17			1.78E-19	1.30E-03	2E-22
1,1,1-Trichloroethane	1.39E-14	0.83	4	60	1	70	365	1	70	1.08E-16	0.3	3.61E-16	1.55E-18		0E+00
Trichloroethene	6.32E-14	0.83	4	60	1	70	365	1	70	4.93E-16			7.04E-18	0.017	1E-19
										Hazard Index =		0.00000	Cancer Risk =		5.73E-19

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.83	4	60	1	70	365	1	70	7.80E-10			1.11E-11	0.081	9E-13
1,1-Dichloroethane	3.21E-08	0.83	4	60	1	70	365	1	70	2.50E-10	0.1	2.50E-09	3.58E-12		0E+00
1,1-Dichloroethene	2.22E-08	0.83	4	60	1	70	365	1	70	1.73E-10			2.47E-12	1.2	3E-12
1,2-Dichloroethene	4.79E-07	0.83	4	60	1	70	365	1	70	3.73E-09			5.34E-11		0E+00
Tetrachloroethene	2.56E-07	0.83	4	60	1	70	365	1	70	2.00E-09			2.85E-11	1.30E-03	4E-14
1,1,1-Trichloroethane	3.44E-07	0.83	4	60	1	70	365	1	70	2.68E-09	0.3	8.94E-09	3.83E-11		0E+00
Trichloroethene	3.35E-06	0.83	4	60	1	70	365	1	70	2.61E-08			3.73E-10	0.017	6E-12
										Hazard Index =		0.00000	Cancer Risk =		1.02E-11

TABLE D-5.4
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
FUTURE ON-SITE WORKERS - ADULT

Equation: Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL
Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	2.5	8	250	25	70	365	25	70	1.07E-16			3.81E-17	0.081	3E-18
1,1-Dichloroethane	2.97E-16	2.5	8	250	25	70	365	25	70	5.81E-17	0.1	5.81E-16	2.08E-17		0E+00
1,1-Dichloroethene	1.13E-16	2.5	8	250	25	70	365	25	70	2.21E-17			7.90E-18	1.2	9E-18
1,2-Dichloroethene	2.12E-15	2.5	8	250	25	70	365	25	70	4.15E-16			1.48E-16		0E+00
Tetrachloroethene	1.05E-16	2.5	8	250	25	70	365	25	70	2.05E-17			7.34E-18	1.30E-03	1E-20
1,1,1-Trichloroethane	1.64E-15	2.5	8	250	25	70	365	25	70	3.21E-16	0.3	1.07E-15	1.15E-16		0E+00
Trichloroethene	2.99E-15	2.5	8	250	25	70	365	25	70	5.85E-16			2.09E-16	0.017	4E-18
										Hazard Index =		0.00000	Cancer Risk =		1.61E-17

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	2.5	8	250	25	70	365	25	70	2.23E-09			7.97E-10	0.081	6E-11
1,1-Dichloroethane	5.45E-09	2.5	8	250	25	70	365	25	70	1.07E-09	0.1	1.07E-08	3.81E-10		0E+00
1,1-Dichloroethene	6.34E-10	2.5	8	250	25	70	365	25	70	1.24E-10			4.43E-11	1.2	5E-11
1,2-Dichloroethene	2.19E-08	2.5	8	250	25	70	365	25	70	4.29E-09			1.53E-09		0E+00
Tetrachloroethene	1.67E-08	2.5	8	250	25	70	365	25	70	3.27E-09			1.17E-09	1.30E-03	2E-12
1,1,1-Trichloroethane	4.07E-08	2.5	8	250	25	70	365	25	70	7.96E-09	0.3	2.65E-08	2.84E-09		0E+00
Trichloroethene	1.59E-07	2.5	8	250	25	70	365	25	70	3.11E-08			1.11E-08	0.017	2E-10
										TOTAL HAZARD INDEX =		0.00000	TOTAL CANCER RISK =		3.08E-10

TABLE D-5.4, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.83	4	250	9	70	365	9	70	1.56E-16			2.00E-17	0.081	2E-18
1,1-Dichloroethane	1.75E-15	0.83	4	250	9	70	365	9	70	5.68E-17	0.1	5.68E-16	7.31E-18		0E+00
1,1-Dichloroethene	3.96E-15	0.83	4	250	9	70	365	9	70	1.29E-16			1.65E-17	1.2	2E-17
1,2-Dichloroethene	4.62E-14	0.83	4	250	9	70	365	9	70	1.50E-15			1.93E-16		0E+00
Tetrachloroethene	1.60E-15	0.83	4	250	9	70	365	9	70	5.20E-17			6.68E-18	1.30E-03	9E-21
1,1,1-Trichloroethane	1.39E-14	0.83	4	250	9	70	365	9	70	4.52E-16	0.3	1.51E-15	5.81E-17		0E+00
Trichloroethene	6.32E-14	0.83	4	250	9	70	365	9	70	2.05E-15			2.64E-16	0.017	4E-18
										Hazard Index =		0.00000	Cancer Risk =		2.60E-17

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.83	4	250	9	70	365	9	70	3.25E-09			4.18E-10	0.081	3E-11
1,1-Dichloroethane	3.21E-08	0.83	4	250	9	70	365	9	70	1.04E-09	0.1	1.04E-08	1.34E-10		0E+00
1,1-Dichloroethene	2.22E-08	0.83	4	250	9	70	365	9	70	7.21E-10			9.27E-11	1.2	1E-10
1,2-Dichloroethene	4.79E-07	0.83	4	250	9	70	365	9	70	1.56E-08			2.00E-09		0E+00
Tetrachloroethene	2.56E-07	0.83	4	250	9	70	365	9	70	8.32E-09			1.07E-09	1.30E-03	1E-12
1,1,1-Trichloroethane	3.44E-07	0.83	4	250	9	70	365	9	70	1.12E-08	0.3	3.72E-08	1.44E-09		0E+00
Trichloroethene	3.35E-06	0.83	4	250	9	70	365	9	70	1.09E-07			1.40E-08	0.017	2E-10
										Hazard Index =		0.00000	Cancer Risk =		3.84E-10

TABLE D-5.5
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
CURRENT TRESPASSERS - ADULT

Equation: Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL
Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDI (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	0.83	4	52	30	70	365	30	70	3.68E-18			1.58E-18	0.081	1E-19
1,1-Dichloroethane	2.97E-16	0.83	4	52	30	70	365	30	70	2.01E-18	0.1	2.01E-17	8.60E-19		0E+00
1,1-Dichloroethene	1.13E-16	0.83	4	52	30	70	365	30	70	7.64E-19			3.27E-19	1.2	4E-19
1,2-Dichloroethene	2.12E-15	0.83	4	52	30	70	365	30	70	1.43E-17			6.14E-18		0E+00
Tetrachloroethene	1.05E-16	0.83	4	52	30	70	365	30	70	7.09E-19			3.04E-19	1.30E-03	4E-22
1,1,1-Trichloroethane	1.64E-15	0.83	4	52	30	70	365	30	70	1.11E-17	0.3	3.69E-17	4.75E-18		0E+00
Trichloroethene	2.99E-15	0.83	4	52	30	70	365	30	70	2.02E-17			8.66E-18	0.017	1E-19
										Hazard Index =		0.00000	Cancer Risk =		6.68E-19

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDI (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	0.83	4	52	30	70	365	30	70	7.70E-11			3.30E-11	0.081	3E-12
1,1-Dichloroethane	5.45E-09	0.83	4	52	30	70	365	30	70	3.68E-11	0.1	3.68E-10	1.58E-11		0E+00
1,1-Dichloroethene	6.34E-10	0.83	4	52	30	70	365	30	70	4.28E-12			1.84E-12	1.2	2E-12
1,2-Dichloroethene	2.19E-08	0.83	4	52	30	70	365	30	70	1.48E-10			6.34E-11		0E+00
Tetrachloroethene	1.67E-08	0.83	4	52	30	70	365	30	70	1.13E-10			4.84E-11	1.30E-03	6E-14
1,1,1-Trichloroethane	4.07E-08	0.83	4	52	30	70	365	30	70	2.75E-10	0.3	9.17E-10	1.18E-10		0E+00
Trichloroethene	1.59E-07	0.83	4	52	30	70	365	30	70	1.07E-09			4.60E-10	0.017	8E-12
										TOTAL HAZARD INDEX =		0.00000	TOTAL CANCER RISK =		1.28E-11

TABLE D-5.5, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.7	2	26	9	70	365	9	70	6.84E-18			8.79E-19	0.081	7E-20
1,1-Dichloroethane	1.75E-15	0.7	2	26	9	70	365	9	70	2.49E-18	0.1	2.49E-17	3.21E-19		0E+00
1,1-Dichloroethene	3.96E-15	0.7	2	26	9	70	365	9	70	5.64E-18			7.25E-19	1.2	9E-19
1,2-Dichloroethene	4.62E-14	0.7	2	26	9	70	365	9	70	6.58E-17			8.46E-18		0E+00
Tetrachloroethene	1.60E-15	0.7	2	26	9	70	365	9	70	2.28E-18			2.93E-19	1.30E-03	4E-22
1,1,1-Trichloroethane	1.39E-14	0.7	2	26	9	70	365	9	70	1.98E-17	0.3	6.60E-17	2.55E-18		0E+00
Trichloroethene	6.32E-14	0.7	2	26	9	70	365	9	70	9.00E-17			1.16E-17	0.017	2E-19
										Hazard Index =		0.00000	Cancer Risk =		1.14E-18

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.7	2	26	9	70	365	9	70	1.42E-10			1.83E-11	0.081	1E-12
1,1-Dichloroethane	3.21E-08	0.7	2	26	9	70	365	9	70	4.57E-11	0.1	4.57E-10	5.88E-12		0E+00
1,1-Dichloroethene	2.22E-08	0.7	2	26	9	70	365	9	70	3.16E-11			4.07E-12	1.2	5E-12
1,2-Dichloroethene	4.79E-07	0.7	2	26	9	70	365	9	70	6.82E-10			8.77E-11		0E+00
Tetrachloroethene	2.56E-07	0.7	2	26	9	70	365	9	70	3.65E-10			4.69E-11	1.30E-03	6E-14
1,1,1-Trichloroethane	3.44E-07	0.7	2	26	9	70	365	9	70	4.90E-10	0.3	1.63E-09	6.30E-11		0E+00
Trichloroethene	3.35E-06	0.7	2	26	9	70	365	9	70	4.77E-09			6.14E-10	0.017	1E-11
										Hazard Index =		0.00000	Cancer Risk =		1.69E-11

TABLE D-5.6
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
CURRENT AND FUTURE TRESPASSERS - CHILD

Equation: Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL
Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	0.8	4	52	6	15	365	6	70	1.66E-17			1.42E-18	0.081	1E-19
1,1-Dichloroethane	2.97E-16	0.8	4	52	6	15	365	6	70	9.03E-18	0.1	9.03E-17	7.74E-19		0E+00
1,1-Dichloroethene	1.13E-16	0.8	4	52	6	15	365	6	70	3.43E-18			2.94E-19	1.2	4E-19
1,2-Dichloroethene	2.12E-15	0.8	4	52	6	15	365	6	70	6.44E-17			5.52E-18		0E+00
Tetrachloroethene	1.05E-16	0.8	4	52	6	15	365	6	70	3.19E-18			2.74E-19	1.30E-03	4E-22
1,1,1-Trichloroethane	1.64E-15	0.8	4	52	6	15	365	6	70	4.98E-17	0.3	1.66E-16	4.27E-18		0E+00
Trichloroethene	2.99E-15	0.8	4	52	6	15	365	6	70	9.09E-17			7.79E-18	0.017	1E-19
										Hazard Index =		0.00000	Cancer Risk =		6.01E-19

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	0.8	4	52	6	15	365	6	70	3.46E-10			2.97E-11	0.081	2E-12
1,1-Dichloroethane	5.45E-09	0.8	4	52	6	15	365	6	70	1.66E-10	0.1	1.66E-09	1.42E-11		0E+00
1,1-Dichloroethene	6.34E-10	0.8	4	52	6	15	365	6	70	1.93E-11			1.65E-12	1.2	2E-12
1,2-Dichloroethene	2.19E-08	0.8	4	52	6	15	365	6	70	6.66E-10			5.71E-11		0E+00
Tetrachloroethene	1.67E-08	0.8	4	52	6	15	365	6	70	5.08E-10			4.35E-11	1.30E-03	6E-14
1,1,1-Trichloroethane	4.07E-08	0.8	4	52	6	15	365	6	70	1.24E-09	0.3	4.12E-09	1.06E-10		0E+00
Trichloroethene	1.59E-07	0.8	4	52	6	15	365	6	70	4.83E-09			4.14E-10	0.017	7E-12
										TOTAL HAZARD INDEX =		0.00000	TOTAL CANCER RISK =		1.15E-11

TABLE D-5.6, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.4	2	26	6	15	365	6	70	1.82E-17			1.56E-18	0.081	1E-19
1,1-Dichloroethane	1.75E-15	0.4	2	26	6	15	365	6	70	6.65E-18	0.1	6.65E-17	5.70E-19		0E+00
1,1-Dichloroethene	3.96E-15	0.4	2	26	6	15	365	6	70	1.50E-17			1.29E-18	1.2	2E-18
1,2-Dichloroethene	4.62E-14	0.4	2	26	6	15	365	6	70	1.76E-16			1.50E-17		0E+00
Tetrachloroethene	1.60E-15	0.4	2	26	6	15	365	6	70	6.08E-18			5.21E-19	1.30E-03	7E-22
1,1,1-Trichloroethane	1.39E-14	0.4	2	26	6	15	365	6	70	5.28E-17	0.3	1.76E-16	4.53E-18		0E+00
Trichloroethene	6.32E-14	0.4	2	26	6	15	365	6	70	2.40E-16			2.06E-17	0.017	3E-19
										Hazard Index =		0.00000	Cancer Risk =		2.02E-18

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.4	2	26	6	15	365	6	70	3.80E-10			3.26E-11	0.081	3E-12
1,1-Dichloroethane	3.21E-08	0.4	2	26	6	15	365	6	70	1.22E-10	0.1	1.22E-09	1.05E-11		0E+00
1,1-Dichloroethene	2.22E-08	0.4	2	26	6	15	365	6	70	8.43E-11			7.23E-12	1.2	9E-12
1,2-Dichloroethene	4.79E-07	0.4	2	26	6	15	365	6	70	1.82E-09			1.56E-10		0E+00
Tetrachloroethene	2.56E-07	0.4	2	26	6	15	365	6	70	9.73E-10			8.34E-11	1.30E-03	1E-13
1,1,1-Trichloroethane	3.44E-07	0.4	2	26	6	15	365	6	70	1.31E-09	0.3	4.36E-09	1.12E-10		0E+00
Trichloroethene	3.35E-06	0.4	2	26	6	15	365	6	70	1.27E-08			1.09E-09	0.017	2E-11
										Hazard Index =		0.00000	Cancer Risk =		3.00E-11

TABLE D-5.7
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
CURRENT OFF-SITE RESIDENTS - ADULT

Equation: Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL
Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	0.83	4	350	30	70	365	30	70	2.48E-17			1.06E-17	0.081	9E-19
1,1-Dichloroethane	2.97E-16	0.83	4	350	30	70	365	30	70	1.35E-17	0.1	1.35E-16	5.79E-18		0E+00
1,1-Dichloroethene	1.13E-16	0.83	4	350	30	70	365	30	70	5.14E-18			2.20E-18	1.2	3E-18
1,2-Dichloroethene	2.12E-15	0.83	4	350	30	70	365	30	70	9.64E-17			4.13E-17		0E+00
Tetrachloroethene	1.05E-16	0.83	4	350	30	70	365	30	70	4.78E-18			2.05E-18	1.30E-03	3E-21
1,1,1-Trichloroethane	1.64E-15	0.83	4	350	30	70	365	30	70	7.46E-17	0.3	2.49E-16	3.20E-17		0E+00
Trichloroethene	2.99E-15	0.83	4	350	30	70	365	30	70	1.36E-16			5.83E-17	0.017	1E-18
										Hazard Index =		0.00000	Cancer Risk =		4.50E-18

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	0.83	4	350	30	70	365	30	70	5.18E-10			2.22E-10	0.081	2E-11
1,1-Dichloroethane	5.45E-09	0.83	4	350	30	70	365	30	70	2.48E-10	0.1	2.48E-09	1.06E-10		0E+00
1,1-Dichloroethene	6.34E-10	0.83	4	350	30	70	365	30	70	2.88E-11			1.24E-11	1.2	1E-11
1,2-Dichloroethene	2.19E-08	0.83	4	350	30	70	365	30	70	9.96E-10			4.27E-10		0E+00
Tetrachloroethene	1.67E-08	0.83	4	350	30	70	365	30	70	7.60E-10			3.26E-10	1.30E-03	4E-13
1,1,1-Trichloroethane	4.07E-08	0.83	4	350	30	70	365	30	70	1.85E-09	0.3	6.17E-09	7.93E-10		0E+00
Trichloroethene	1.59E-07	0.83	4	350	30	70	365	30	70	7.23E-09			3.10E-09	0.017	5E-11
										TOTAL HAZARD INDEX =		0.00000	TOTAL CANCER RISK =		8.59E-11

TABLE D-5.7, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.7	2	275	9	70	365	9	70	7.23E-17			9.30E-18	0.081	8E-19
1,1-Dichloroethane	1.75E-15	0.7	2	275	9	70	365	9	70	2.64E-17	0.1	2.64E-16	3.39E-18		0E+00
1,1-Dichloroethene	3.96E-15	0.7	2	275	9	70	365	9	70	5.97E-17			7.67E-18	1.2	9E-18
1,2-Dichloroethene	4.62E-14	0.7	2	275	9	70	365	9	70	6.96E-16			8.95E-17		0E+00
Tetrachloroethene	1.60E-15	0.7	2	275	9	70	365	9	70	2.41E-17			3.10E-18	1.30E-03	4E-21
1,1,1-Trichloroethane	1.39E-14	0.7	2	275	9	70	365	9	70	2.09E-16	0.3	6.98E-16	2.69E-17		0E+00
Trichloroethene	6.32E-14	0.7	2	275	9	70	365	9	70	9.52E-16			1.22E-16	0.017	2E-18
										Hazard Index =		0.00000	Cancer Risk =		1.20E-17

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.7	2	275	9	70	365	9	70	1.51E-09			1.94E-10	0.081	2E-11
1,1-Dichloroethane	3.21E-08	0.7	2	275	9	70	365	9	70	4.84E-10	0.1	4.84E-09	6.22E-11		0E+00
1,1-Dichloroethene	2.22E-08	0.7	2	275	9	70	365	9	70	3.35E-10			4.30E-11	1.2	5E-11
1,2-Dichloroethene	4.79E-07	0.7	2	275	9	70	365	9	70	7.22E-09			9.28E-10		0E+00
Tetrachloroethene	2.56E-07	0.7	2	275	9	70	365	9	70	3.86E-09			4.96E-10	1.30E-03	6E-13
1,1,1-Trichloroethane	3.44E-07	0.7	2	275	9	70	365	9	70	5.18E-09	0.3	1.73E-08	6.66E-10		0E+00
Trichloroethene	3.35E-06	0.7	2	275	9	70	365	9	70	5.05E-08			6.49E-09	0.017	1E-10
										Hazard Index =		0.00000	Cancer Risk =		1.78E-10

TABLE D-5.8
CMW SITE - REASONABLE MAXIMUM EXPOSURE
INHALATION OF CHEMICALS IN SOILS
CURRENT OFF-SITE RESIDENTS - CHILD

Equation:
Intake (mg/kg-dy) = (CA x IR x ET x EF x ED)/(BW x AT1 x AT2 or AT3)
Intake/RfD = Hazard Quotient
Intake x SF = Risk

STOCK PILED SOIL
Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	5.45E-16	0.8	4	350	6	15	365	6	70	1.11E-16			9.56E-18	0.081	8E-19
1,1-Dichloroethane	2.97E-16	0.8	4	350	6	15	365	6	70	6.08E-17	0.1	6.08E-16	5.21E-18		0E+00
1,1-Dichloroethene	1.13E-16	0.8	4	350	6	15	365	6	70	2.31E-17			1.98E-18	1.2	2E-18
1,2-Dichloroethene	2.12E-15	0.8	4	350	6	15	365	6	70	4.34E-16			3.72E-17		0E+00
Tetrachloroethene	1.05E-16	0.8	4	350	6	15	365	6	70	2.15E-17			1.84E-18	1.30E-03	2E-21
1,1,1-Trichloroethane	1.64E-15	0.8	4	350	6	15	365	6	70	3.35E-16	0.3	1.12E-15	2.88E-17		0E+00
Trichloroethene	2.99E-15	0.8	4	350	6	15	365	6	70	6.12E-16			5.24E-17	0.017	9E-19
										Hazard Index =		0.00000	Cancer Risk =		4.05E-18

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.14E-08	0.8	4	350	6	15	365	6	70	2.33E-09			2.00E-10	0.081	2E-11
1,1-Dichloroethane	5.45E-09	0.8	4	350	6	15	365	6	70	1.11E-09	0.1	1.11E-08	9.56E-11		0E+00
1,1-Dichloroethene	6.34E-10	0.8	4	350	6	15	365	6	70	1.30E-10			1.11E-11	1.2	1E-11
1,2-Dichloroethene	2.19E-08	0.8	4	350	6	15	365	6	70	4.48E-09			3.84E-10		0E+00
Tetrachloroethene	1.67E-08	0.8	4	350	6	15	335	6	70	3.42E-09			2.93E-10	1.30E-03	4E-13
1,1,1-Trichloroethane	4.07E-08	0.8	4	350	6	15	365	6	70	8.33E-09	0.3	2.78E-08	7.14E-10		0E+00
Trichloroethene	1.59E-07	0.8	4	350	6	15	365	6	70	3.25E-08			2.79E-09	0.017	5E-11
										TOTAL HAZARD INDEX =		0.00000	TOTAL CANCER RISK =		7.73E-11

TABLE D-5.8, CONT'D
SOIL DURING EXCAVATION

Volatilized Chemicals

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	4.80E-15	0.4	2	275	6	15	365	6	70	1.93E-16			1.65E-17	0.081	1E-18
1,1-Dichloroethane	1.75E-15	0.4	2	275	6	15	365	6	70	7.03E-17	0.1	7.03E-16	6.03E-18		0E+00
1,1-Dichloroethene	3.96E-15	0.4	2	275	6	15	365	6	70	1.59E-16			1.36E-17	1.2	2E-17
1,2-Dichloroethene	4.62E-14	0.4	2	275	6	15	365	6	70	1.86E-15			1.59E-16		0E+00
Tetrachloroethene	1.60E-15	0.4	2	275	6	15	365	6	70	6.43E-17			5.51E-18	1.30E-03	7E-21
1,1,1-Trichloroethane	1.39E-14	0.4	2	275	6	15	365	6	70	5.59E-16	0.3	1.86E-15	4.79E-17		0E+00
Trichloroethene	6.32E-14	0.4	2	275	6	15	365	6	70	2.54E-15			2.18E-16	0.017	4E-18
										Hazard Index =		0.00000	Cancer Risk =		2.14E-17

Entrained Soil Particles

CHEMICAL	CA (mg/m3)	IR (m3/hr)	ET (hr/dy)	EF (dy/yr)	ED (yr)	BW (kg)	AT1 (dy/yr)	AT2 (yr)	AT3 (yr)	Intake (mg/kg-dy)	RfDi (mg/kg-dy)	Hazard Quotient (unitless)	Intake (mg/kg-dy)	SF (mg/kg-dy)-1	Risk (unitless)
Chloroform	1.00E-07	0.4	2	275	6	15	365	6	70	4.02E-09			3.44E-10	0.081	3E-11
1,1-Dichloroethane	3.21E-08	0.4	2	275	6	15	365	6	70	1.29E-09	0.1	1.29E-08	1.11E-10		0E+00
1,1-Dichloroethene	2.22E-08	0.4	2	275	6	15	365	6	70	8.92E-10			7.65E-11	1.2	9E-11
1,2-Dichloroethene	4.79E-07	0.4	2	275	6	15	365	6	70	1.92E-08			1.65E-09		0E+00
Tetrachloroethene	2.56E-07	0.4	2	275	6	15	365	6	70	1.03E-08			8.82E-10	1.30E-03	1E-12
1,1,1-Trichloroethane	3.44E-07	0.4	2	275	6	15	365	6	70	1.38E-08	0.3	4.61E-08	1.18E-09		0E+00
Trichloroethene	3.35E-06	0.4	2	275	6	15	365	6	70	1.35E-07			1.15E-08	0.017	2E-10
										Hazard Index =		0.00000	Cancer Risk =		3.17E-10

TABLE D-6.1
EMISSION OF VOLATILE ORGANIC CHEMICALS - MAXIMUM SOIL PILE CONCENTRATION

Chemical Emission Rate: $E = D\ C_s\ A\ P_t^{4/3}\ (M/d_{sc})$

Where:

E = Average emission rate of chemical over time (g/sec);
D = Diffusion coefficient in air (cm^2/sec) (obtained from "Hazardous Waste Treatment, Storage and Disposal Facilitites (TSDFs) Air Emission Models" (review draft) EPA-450/3-87-026, 11/89);
C_s = Saturated vapor concentration of chemical (g/cm) calculated: $Ci = (p\ MWi)/(R\ T)$ (p and MW obtained from U.S. EPA, "RREL Treatability Database");
A = Exposed surface area (cm2) - area around building and the parking lot, approximately 200,000 ft^2 = 186,000,000 cm^2;
P_t = Total soil porosity (assumed values);
M = Mole fraction of component (gmole/gmole) (weight fraction of component (ug/ug), is used in lieu of the mole fraction, based on soil sample concentrations of chemical, C_s, see attached *; and,
d_{sc} = Effective depth of soil cover (cm).

Model from: "Air/Superfund National Technical Guidance Study Series - Volume II: Estimation of Baseline Air Emissions at Superfund Sites" EPA/450/1-89-002a, 8/90

CHEMICAL	C Soil Concentration (ug/kg)	D Diffusion in Air (cm^2/sec)	p Vapor Pressure (mm Hg)	MW Molecular Weight (g/mole)	Cs Saturated Vapor Concentration (g/cm^3)	A Contaminated Area (cm^2)	Pt Assumed Porosity	L Clean Cover (cm)	CF Conversion Factor (kg/ug)	M Mole Fraction of Chemical in Soil (mg/mg)	E Average Emission Rate (g/sec)
Chloroform	90	0.010	151	119	0.00097	3480000	0.5	1	1.0E-09	9.00E-08	1.18E-06
1,1-Dichloroethane	43	0.011	182	99	0.00097	3480000	0.5	1	1.0E-09	4.30E-08	6.45E-07
1,1-Dichloroethene	5	0.011	600	97	0.00313	3480000	0.5	1	1.0E-09	5.00E-09	2.46E-07
1,2-Dichloroethene	173	0.011	324	97	0.00169	3480000	0.5	1	1.0E-09	1.73E-07	4.59E-06
Tetrachloroethene	132	0.008	17.8	166	0.00016	3480000	0.5	1	1.0E-09	1.32E-07	2.27E-07
1,1,1-Trichloroethane	321	0.009	123	133	0.00088	3480000	0.5	1	1.0E-09	3.21E-07	3.56E-06
Trichloroethene	1251	0.009	57.9	131	0.00041	3480000	0.5	1	1.0E-09	1.25E-06	6.50E-06

Dispersion Chemical Emission Rate: $C_x = Q / Pi\ d_y\ d_z\ u$

Where:

C_x = Chemical concentration in air (g/m^2);
Q = E = Release (emission) rate of chemicals from the site (g/hr);
Pi = 3.14;
d_y = Dispersion coefficient in lateral (crosswind) direction (m) (Figure 3-5, EPA/540/1-88/001)
d_z = Dispersion coefficient in vertical direction (m) (Figure 3-5, EPA/540/1-88/001)
u = Mean wind speed (m/hr) (from Table 4-1, EPA/600/8-85/002, 2-85).

Model from: "Superfund Exposure Assessment Manual" EPA/540/1-88/001.

CHEMICAL	E Average Emission Rate (g/sec)	PI	d_y Dispersion Coefficient (m)	d_z Dispersion Coefficient (m)	u Mean Wind Speed (m/hr)	CF Conversion Factor (g/mg)	C_x Chemical Concentration (mg/m^2)
Chloroform	1.18E-06	3.14	8	4.8	18000	0.001	5.45E-16
1,1-Dichloroethane	6.45E-07	3.14	8	4.8	18000	0.001	2.97E-16
1,1-Dichloroethene	2.46E-07	3.14	8	4.8	18000	0.001	1.13E-16
1,2-Dichloroethene	4.59E-06	3.14	8	4.8	18000	0.001	2.12E-15
Tetrachloroethene	2.27E-07	3.14	8	4.8	18000	0.001	1.05E-16
1,1,1-Trichloroethane	3.56E-06	3.14	8	4.8	18000	0.001	1.64E-15
Trichloroethene	6.50E-06	3.14	8	4.8	18000	0.001	2.99E-15

TABLE D-6.2
EMISSION OF VOLATILE ORGANIC CHEMICALS - MAXIMUM EXCAVATED SOIL CONCENTRATION

Chemical Emission Rate: $E = D\ C_s\ A\ P_t^{4/3}\ (M/d_{sc})$

Where:

E = Average emission rate of chemical over time (g/sec);
D = Diffusion coefficient in air (cm^2/sec) (obtained from "Hazardous Waste Treatment, Storage and Disposal Facilitites (TSDFs) Air Emission Models" (review draft) EPA-450/3-87-026, 11/89);
C_s = Saturated vapor concentration of chemical (g/cm) calculated: $Ci = (p\ MWi)/(R\ T)$ (p and MW obtained from U.S. EPA, "RREL Treatability Database");
A = Exposed surface area (cm2) - area around building and the parking lot, approximately 200,000 ft^2 = 186,000,000 cm^2;
P_t = Total soil porosity (assumed values);
M = Mole fraction of component (gmole/gmole) (weight fraction of component (ug/ug), is used in lieu of the mole fraction, based on soil sample concentrations of chemical, C_s, see attached "; and,
d_{sc} = Effective depth of soil cover (cm).

Model from: "Air/Superfund National Technical Guidance Study Series - Volume II: Estimation of Baseline Air Emissions at Superfund Sites" EPA/450/1-89-002a, 8/90

CHEMICAL	C Soil Concentration (ug/kg)	D Diffusion in Air (cm^2/sec)	p Vapor Pressure (mm Hg)	MW Molecular Weight (g/mole)	Cs Saturated Vapor Concentration (g/cm^3)	A Contaminated Area (cm^2)	Pt Assumed Porosity	L Clean Cover (cm)	CF Conversion Factor (kg/ug)	M Mole Fraction of Chemical in Soil (mg/mg)	E Average Emission Rate (g/sec)
Chloroform	792	0.010	151	119	0.00097	3480000	0.5	1	1.0E-09	7.92E-07	1.04E-05
1,1-Dichloroethane	253	0.011	182	99	0.00097	3480000	0.5	1	1.0E-09	2.53E-07	3.79E-06
1,1-Dichloroethene	175	0.011	600	97	0.00313	3480000	0.5	1	1.0E-09	1.75E-07	8.60E-06
1,2-Dichloroethene	3778	0.011	324	97	0.00169	3480000	0.5	1	1.0E-09	3.78E-06	1.00E-04
Tetrachloroethene	2021	0.008	17.8	166	0.00016	3480000	0.5	1	1.0E-09	2.02E-06	3.47E-06
1,1,1-Trichloroethane	2714	0.009	123	133	0.00088	3480000	0.5	1	1.0E-09	2.71E-06	3.01E-05
Trichloroethene	26388	0.009	57.9	131	0.00041	3480000	0.5	1	1.0E-09	2.64E-05	1.37E-04

Dispersion Chemical Emission Rate: $C_x = Q / Pi\ d_y\ d_z\ u$

Where:

C_x = Chemical concentration in air (g/m^3);
$Q = E$ = Release (emission) rate of chemicals from the site (g/hr);
Pi = 3.14;
d_y = Dispersion coefficient in lateral (crosswind) direction (m) (Figure 3-5, EPA/540/1-88/001)
d_z = Dispersion coefficient in vertical direction (m) (Figure 3-5, EPA/540/1-88/001)
u = Mean wind speed (m/hr) (from Table 4-1, EPA/600/8-85/002, 2-85).

Model from: "Superfund Exposure Assessment Manual" EPA/540/1-88/001.

CHEMICAL	E Average Emission Rate (g/sec)	Pi	d_y Dispersion Coefficient (m)	d_z Dispersion Coefficient (m)	u Mean Wind Speed (m/hr)	CF Conversion Factor (g/mg)	C_x Chemical Concentration (mg/m^3)
Chloroform	1.04E-05	3.14	8	4.8	18000	0.001	4.80E-15
1,1-Dichloroethane	3.79E-06	3.14	8	4.8	18000	0.001	1.75E-15
1,1-Dichloroethene	8.60E-06	3.14	8	4.8	18000	0.001	3.96E-15
1,2-Dichloroethene	1.00E-04	3.14	8	4.8	18000	0.001	4.62E-14
Tetrachloroethene	3.47E-06	3.14	8	4.8	18000	0.001	1.60E-15
1,1,1-Trichloroethane	3.01E-05	3.14	8	4.8	18000	0.001	1.39E-14
Trichloroethene	1.37E-04	3.14	8	4.8	18000	0.001	6.32E-14

TABLE D-7.1
RAPID ESTIMATION OF PARTICULATE EMISSIONS FROM SOILS (0-1 & 0-3 FEET)
WITH LIMITED WIND EROSIONS - SOIL ACTIVITIES -SCENARIO 1 AND 2

EQUATIONS: $E_{10} = 0.83\,[f\,P(u_+)\,(1-V)] / (PE/50)^2$

Where:
$P(u_+) = 6.7\,(u_+ - u_t)$
$u_t = (\,[\,(u^*_t \text{ corrected})\,\ln(Z/Z_0)\,] / 0.4\,)(\,1\text{ m}/100\text{ cm})$ (conversion from cm/sec to m/sec)
u^*_t corrected = (u^*_t uncorrected) (CF)

Model and tabled values from EPA's "Rapid Assessment of Particulate Emissions from Surface Contamination Sites" EPA/600/8-85/002, 2/85.

SCENARIO	Particle Size Mode (mm)	u^*_t Uncorrected Threshold Friction Velocity (cm/sec)	CF Correction Factor (Fig 3-5)	u^*_t Corrected Threshold Friction Velocity (cm/sec)	Z_0 Roughness Height (cm)	Z Height Above Surface (cm)	u_t Threshold Friction Velocity At Height Z (m/s)	u_+ Fastest Mile of Wind (m/s)	Empirical Constant	$P(u_+)$ Erosion Potential (g/m2)	Empirical Constant	f Frequency of Soil Disturbances (unitless)	V Fraction of Continuous Vegatative Cover (decimal %)	PE Preciptation/ Evaporation Index (unitless)	E_{10} **PM10 Emission Factor (mg/m2-hr)**
1A	1	66	1.5	99	1.5	700	15.21	25.8	6.7	70.95	0.83	5	0	90	**90.88**
1B	0.5	48	1.5	72	1.5	700	11.06	25.8	6.7	98.74	0.83	5	0	90	**126.48**
1C	0.2	33	1.5	49.5	1.5	700	7.61	25.8	6.7	121.91	0.83	5	0	90	**156.14**
1D	0.1	25	1.5	37.5	1.5	700	5.76	25.8	6.7	134.26	0.83	5	0	90	**171.97**
2A	1	66	1.5	99	1.5	700	15.21	25.8	6.7	70.95	0.83	23	0	90	**418.04**
2B	0.5	48	1.5	72	1.5	700	11.06	25.8	6.7	98.74	0.83	23	0	90	**581.80**
2C	0.2	33	1.5	49.5	1.5	700	7.61	25.8	6.7	121.91	0.83	23	0	90	**718.26**
2D	0.1	25	1.5	37.5	1.5	700	5.76	25.8	6.7	134.26	0.83	23	0	90	**791.04**

Scenarios assume the following:
Scenario 1: Normal Activities, i.e. off-site residence, current and future trespassers, and future on-site workers - 0.0% vegitative cover and 5 soil disturbances per month;
Scenario 2: Intrusive Activities, i.e. future construction workers - 0.0% vegitative cover and 23 soil disturbances per month;
Scenario A: Particle size mode = 1 mm;
Scenario B: Particle size mode = 0.5 mm;
Scenario C: Particle size mode = 0.2 mm;
Scenario D: Particle size mode = 0.1 mm.

PARAMETERS

Particle mode	Aggregate size distribution mode (mm): assumed values: 1 (coarse sand); 0.5 (medium sand); 0.2 (fine sand); 0.1 (very fine sand). (Values from Chorley et al., Geomorphology, 1984). Fig 3-4 in EPA (1985) goes no lower than 0.1 mm.
u^*_t uncorrected	Threshold friction velocity - based on particle size (Figure 3-4, EPA/600/8-85/002, 2/85).
Lc	Ratio of the silhouette area of the roughness elements to the total area of the bare loose soil (assumed value of 10% adopted).
Correction factor	(U^*_t) corrected / (U^*_t) uncorrected, as a function of Lc (Value of 1.5 assinged from figure 3-5, EPA/600/8-85/002,2/85).
u^*_t corrected	Corrected threshold friction velocity (cm/sec)
Z_0	Roughness height at site (cm) (Value of 1.5 cm assumed, from Figure 3-6, EPA/600/8-85/002, 2/85). Anologous to plowed field.
Z	Height above surface (cm), assumed to be 7 meters (reference height in EPA (1985)).
u_t	Threshold friction velocity at a height of 7 meters (Equation 4-3, EPA/600/8-85/002, 2/85).
u_+	Fastest mile of wind (m/sec) for Des Moines, Iowa (From Table 4-1, EPA/600/8-85/002, 2/85).
$P(u_+)$	Erosion potential (g/m2)
f	Frequency of soil disturbance per month (assumed value).
V	Fraction of surface area covered by continuous vegetative cover (0 = bare soil).
PE	Thornthwaite's precipitation/evaporation index (from Figure 4-2, EPA/600/8-85/002, 2/85).
E10	PM10 emission factor (annual average PM10 emission rate per unit area) (mg/m2-hr).

TABLE D-7.2
ESTIMATION OF PARTICLE EMISSION FROM SOILS (0-1 & 0-3 FEET) FROM SITE ACTIVITIES - DISPERSION OF SOIL - BASELINE CONDITION

Baseline Condition: Soil concentrations = 1 mg/kg

EQUATIONS: C_a (baseline) = C_x C_s (baseline) CF

Where:
$C_x = Q / (Pi\ d_y\ d_z\ u)$
$Q = E_{10}\ A$

Area - Dispersion Distance, D = 0.3 km (300 m); Area = 18,600 m_2 (200,000 ft_2)

SCENARIO	E_{10} PM10 Emission Factor (mg/m2-hr)	A Source Area (m2)	Q Release Rate (mg/hr)	d_y Dispersion Coefficient (m)	d_z Dispersion Coefficient (m)	u Mean Wind Speed (m/hr)	Pi	C_x Dispersed PM10 Concentration (mg/m3)	C_s(baseline) Soil Concentration (mg/kg)	CF Conversion Factor (kg/mg)	C_a (baseline) Dispersed Chemical Concentration (mg/m3)
1A	**90.88**	348	31,625	8	4.8	18000	3.14	0.0146	1	1.0E-06	**1.46E-08**
1B	**126.48**	348	44,014	8	4.8	18000	3.14	0.0203	1	1.0E-06	**2.03E-08**
1C	**156.14**	348	54,338	8	4.8	18000	3.14	0.0250	1	1.0E-06	**2.50E-08**
1D	**171.97**	348	59,844	8	4.8	18000	3.14	0.0276	1	1.0E-06	**2.76E-08**
2A	**418.04**	348	145,477	8	4.8	18000	3.14	0.0670	1	1.0E-06	**6.70E-08**
2B	**581.80**	348	202,465	8	4.8	18000	3.14	0.0933	1	1.0E-06	**9.33E-08**
2C	**718.26**	348	249,955	8	4.8	18000	3.14	0.1152	1	1.0E-06	**1.15E-07**
2D	**791.04**	348	275,283	8	4.8	18000	3.14	0.1268	1	1.0E-06	**1.27E-07**

Scenarios assume the following:

Scenario 1: Normal Activities, i.e. off-site residence, current and future trespassers, and future on-site workers - 0.0% vegitative cover and 5 soil disturbances per month;
Scenario 2: Intrusive Activities, i.e. future construction workers - 0.0% vegitative cover and 23 soil disturbances per month;
Scenario A: Particle size mode = 1 mm;
Scenario B: Particle size mode = 0.5 mm;
Scenario C: Particle size mode = 0.2 mm;
Scenario D: Particle size mode = 0.1 mm.

PARAMETERS

E10	PM10 emission factor (mg/m2-hr)
A	Area under consideration (m2) (measured from site base map; rounded upward)
Q	Release rate of soil from area (mg/hr) (= E_{10} x A)
d_y	Dispersion coefficient in lateral (crosswind) direction (m) (Figure 3-5, EPA/540/1-88/001)
d_z	Dispersion coefficient in vertical direction (m) (Figure 3-5, EPA/540/1-88/001)
u	Mean wind speed (m/hr) (from EPA/600/8-85/002, 2/85, 5.0 m/sec)
Pi	Pi = 3.14
C(x)	Concentration of PM10 at distance = D (mg/m3)
Cs(baseline)	Baseline soil concentration (assumed to be 1 mg/kg)
CF	Conversion factor (10^{-6} kg/mg)
Ca(baseline)	Baseline air concentration at distance = D, assuming a soil concentration of 1 mg/kg (mg/m3)

TABLE D-7.3
ESTIMATION OF CHEMICAL CONCENTRATIONS FROM SOIL PILE GENERATED AS PARTICULATES -SCENARIO 1 AND 2

SCENARIO 1

Chemicals of Concern in Soils	C Maximum Concentration In Soil Pile (mg/kg)	1A Concentration In Air, C_a = Baseline (mg/m3) **1.46E-08**	1B Concentration In Air, C_a = Baseline (mg/m3) **2.03E-08**	1C Concentration In Air, C_a = Baseline (mg/m3) **2.50E-08**	1D Concentration In Air, C_a = Baseline (mg/m3) **2.76E-08**
Chloroform	0.09	1.31E-09	1.83E-09	2.25E-09	2.48E-09
1,1-Dichloroethane	0.043	6.27E-10	8.72E-10	1.08E-09	1.19E-09
1,1-Dichloroethene	0.005	7.29E-11	1.01E-10	1.25E-10	1.38E-10
1,2-Dichloroethene	0.173	2.52E-09	3.51E-09	4.33E-09	4.77E-09
Tetrachloroethene	0.132	1.92E-09	2.68E-09	3.30E-09	3.64E-09
1,1,1-Trichloroethane	0.321	4.68E-09	6.51E-09	8.04E-09	8.85E-09
Trichloroethene	1.251	1.82E-08	2.54E-08	3.13E-08	3.45E-08

Scenarios assume the following:

Scenario 1: Normal Activities, i.e. off-site residence, current and future trespassers, and future on-site workers - 0% continuous vegitative cover and 5 soil disturbances per month;
Scenario 2: Intrusive Activities, i.e. future construction workers - 0% continuous vegitative cover and 23 soil disturbances per month;
Scenario A: Particle size mode = 1 mm;
Scenario B: Particle size mode = 0.5 mm;
Scenario C: Particle size mode = 0.2 mm; and,
Scenario D: Particle size mode = 0.1 mm.

*Note: Maximum is Average Concentration + 2 Standard Deviations (95% C.I.)

SCENARIO 2

Chemicals of Concern in Soils	C Maximum Concentration In Soil Pile (mg/kg)	2A Concentration In Air, C_a = Baseline (mg/m3) **6.70E-08**	2B Concentration In Air, C_a = Baseline (mg/mg3) **9.33E-08**	2C Concentration In Air, C_a = Baseline (mg/m3) **1.15E-07**	2D Concentration In Air, C_a = Baseline (mg/m3) **1.27E-07**
Chloroform	0.09	6.03E-09	8.40E-09	1.04E-08	1.14E-08
1,1-Dichloroethane	0.043	2.88E-09	4.01E-09	4.95E-09	5.45E-09
1,1-Dichloroethene	0.005	3.35E-10	4.66E-10	5.76E-10	6.34E-10
1,2-Dichloroethene	0.173	1.16E-08	1.61E-08	1.99E-08	2.19E-08
Tetrachloroethene	0.132	8.85E-09	1.23E-08	1.52E-08	1.67E-08
1,1,1-Trichloroethane	0.321	2.15E-08	2.99E-08	3.70E-08	4.07E-08
Trichloroethene	1.251	8.39E-08	1.17E-07	1.44E-07	1.59E-07

Scenarios assume the following:

Scenario 1: Normal Activities, i.e. off-site residence, current and future trespassers, and future on-site workers - 0.0% continuous vegitative cover and 5 soil disturbances per month;
Scenario 2: Intrusive Activities, i.e. future construction workers - 0.0% continuous vegitative cover and 23 soil disturbances per month;
Scenario A: Particle size mode = 1 mm;
Scenario B: Particle size mode = 0.5 mm;
Scenario C: Particle size mode = 0.2 mm; and,
Scenario D: Particle size mode = 0.1 mm.

*Note: Maximum is Average Concentration + 2 Standard Deviations (95% C.I.)

TABLE D-7.4
ESTIMATION OF CHEMICAL CONCENTRATIONS FROM SOILS DURING EXCAVATION GENERATED AS PARTICULATES -SCENARIO 1 AND 2

SCENARIO 1

Chemicals of Concern in Soils	C Maximum* Concentration In Excv. Soil (mg/kg)	1A Concentration In Air, C_a = Baseline (mg/m3) **1.46E-08**	1B Concentration In Air, C_a = Baseline (mg/m3) **2.03E-08**	1C Concentration In Air, C_a = Baseline (mg/m3) **2.50E-08**	1D Concentration In Air, C_a = Baseline (mg/m3) **2.76E-08**
Chloroform	0.792	1.15E-08	1.61E-08	1.98E-08	2.18E-08
1,1-Dichloroethane	0.253	3.69E-09	5.13E-09	6.33E-09	6.98E-09
1,1-Dichloroethene	0.175	2.55E-09	3.55E-09	4.38E-09	4.83E-09
1,2-Dichloroethene	3.778	5.51E-08	7.66E-08	9.46E-08	1.04E-07
Tetrachloroethene	2.021	2.94E-08	4.10E-08	5.06E-08	5.57E-08
1,1,1-Trichloroethane	2.714	3.95E-08	5.50E-08	6.79E-08	7.48E-08
Trichloroethene	26.388	3.85E-07	5.35E-07	6.61E-07	7.28E-07

Scenarios assume the following:

Scenario 1: Normal Activities, i.e. off-site residence, current and future trespassers, and future on-site workers - 0% continuous vegitative cover and 5 soil disturbances per month;
Scenario 2: Intrusive Activities, i.e. future construction workers - 0% continuous vegitative cover and 23 soil disturbances per month;
Scenario A: Particle size mode = 1 mm;
Scenario B: Particle size mode = 0.5 mm;
Scenario C: Particle size mode = 0.2 mm; and,
Scenario D: Particle size mode = 0.1 mm.

*Note: Maximum is Average Concentration + 2 Standard Deviations (95% C.I.)

SCENARIO 2

Chemicals of Concern in Soils	C Maximum Concentration In Excv. Soil (mg/kg)	2A Concentration In Air, C_a = Baseline (mg/m3) **6.70E-08**	2B Concentration In Air, C_a = Baseline (mg/mg3) **9.33E-08**	2C Concentration In Air, C_a = Baseline (mg/m3) **1.15E-07**	2D Concentration In Air, C_a = Baseline (mg/m3) **1.27E-07**
Chloroform	0.792	5.31E-08	7.39E-08	9.12E-08	1.00E-07
1,1-Dichloroethane	0.253	1.70E-08	2.36E-08	2.91E-08	3.21E-08
1,1-Dichloroethene	0.175	1.17E-08	1.63E-08	2.02E-08	2.22E-08
1,2-Dichloroethene	3.778	2.53E-07	3.52E-07	4.35E-07	4.79E-07
Tetrachloroethene	2.021	1.35E-07	1.89E-07	2.33E-07	2.56E-07
1,1,1-Trichloroethane	2.714	1.82E-07	2.53E-07	3.13E-07	3.44E-07
Trichloroethene	26.388	1.77E-06	2.46E-06	3.04E-06	3.35E-06

Scenarios assume the following:

- Scenario 1: Normal Activities, i.e. off-site residence, current and future trespassers, and future on-site workers - 0.0% continuous vegitative cover and 5 soil disturbances per month;
- Scenario 2: Intrusive Activities, i.e. future construction workers - 0.0% continuous vegitative cover and 23 soil disturbances per month;
- Scenario A: Particle size mode = 1 mm;
- Scenario B: Particle size mode = 0.5 mm;
- Scenario C: Particle size mode = 0.2 mm; and,
- Scenario D: Particle size mode = 0.1 mm.

*Note: Maximum is Average Concentration + 2 Standard Deviations (95% C.I.)

APPENDIX E

CHEMICAL TOXICITY INFORMATION

CARBON TETRACHLORIDE

The main health effects of carbon tetrachloride after either ingestion or inhalation are due to actions on the brain, liver and kidneys. There are many reports of accidental poisonings and deaths in humans due to inhalation of carbon tetrachloride fumes, with the lethal exposure level dependent on the amount of compound present and the duration of exposure. The principal clinical signs of exposure are a swollen and tender liver, elevated serum levels of hepatic enzymes, elevated serum bilirubin, and decreased serum levels of liver proteins (EPA 1984). Clinical signs of kidney dysfunction are also common and include anuria, albuminuria, edema, and hypertension (ATSDR 1988). The levels of the compound which can produce hepatotoxic and nephrotoxic effects in humans are not well-defined.

As in humans, the hepatotoxic and nephrotoxic effects of carbon tetrachloride are the most prominent systemic effects in animals, with the liver being the most sensitive organ. Unlike humans, renal injury does not often occur in animals following inhalation exposure, however, the kidney is a target organ after oral administration of the compound (ATSDR 1988). The critical animal study with carbon tetrachloride was a subchronic study in rats that reported dose-dependent changes in the liver (Bruckner et al. 1986). Doses of 20 mg/kg/day for 11 weeks by oral gavage in rats produced mild signs of liver toxicity, such as mild centrilobular vacuolization, while 80 mg/kg/day produced severe hepatic injury. Doses lower than 20 mg/kg/day were also tested for 12 weeks and it was found that 1 mg/kg/day of carbon tetrachloride produced no hepatic effects (the NOEL), 10 mg/kg/day resulted in mild centrilobular vacuolization, and 33 mg/kg/day produced extensive hepatic damage.

Although the combined mutagenicity data for carbon tetrachloride indicate that it is at best a weak mutagen, the results support its classification as an animal carcinogen. This compound produced hepatocellular carcinomas in all animal species evaluated. For example, hematomas were observed in virtually all mice treated with 1,250 and 2,500 mg/kg carbon tetrachloride by gavage five times/week for 78 weeks (NCI 1976). Hepatocarcinomas were also reported in rats following seven months of chronic inhalation exposure and following subcutaneous injections of 2,000 mg/kg twice weekly for 68 or more weeks (IARC 1979). There are a few reports in humans which have noted the occurrence of liver cancer in people exposed to carbon tetrachloride fumes both acutely and longer term (ATSDR 1988). Therefore, although carbon tetrachloride has not been proven to be a human carcinogen, it is suggested based on the strong animal data.

Carbon tetrachloride has a classification of B2 (probable human carcinogen) based on sufficient subchronic and chronic carcinogenicity data in rats, mice and hamsters (oral administration of carbon tetrachloride produce hepatocellular carcinomas).

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CHLOROFORM

Chloroform (trichloromethane) is often produced during the chlorination of drinking water and thus is a common drinking water contaminant. Chloroform has been detected in 99.5 percent of U.S. finished drinking water samples (ATSDR, 1989). Typical concentrations are in the range of 32-68 ug/L and typical water intakes are calculated to be 64 to 132 ug/person/day.

Chloroform concentrations in air range from 0.02 to 13 ug/m^3. Indoor air samples can range from 0.07 to 3.6 ug/m^3 (ATSDR 1989). Daily exposure due to inhalation is calculated to be 4 to 260 ug/person/day.

In industry, chloroform is used as a solvent for oils, rubber, fats, and waxes; in fire extinguishers; and in the rubber industry.

Chloroform at one time was used as an inhalation anesthetic humans at air concentrations of 8000-10,000 ppm with blood concentrations of 80 to 165 mg/l (ATSDR< 1989). Occupational exposures to levels of 22 to 71 ppm were not associated with liver damage.

Humans may be exposed to chloroform by inhalation, ingestion, or skin contact.

Available data suggests a possible association of chloroform exposures in drinking water with increased risk of rectal, bladder, or colon cancer, but no conclusions can be drawn from the evidence (EPA 1989). Other toxic effects include local irritation of the eyes, central nervous system depression, gastrointestinal irritation, liver and kidney damage, cardiac arrythmia, ventricular tachycardia and bradycardia. Death from chloroform overdosing can occur and is attributed to ventricular fibrillation. Chloroform anesthesia can produce delayed death as a result of liver necrosis.

In laboratory animals, exposure to chloroform produces liver and kidney damage. Chronic administration by gavage is reported to increase the incidence of kidney epithelial tumors in rats and of hepatocellular carcinomas in mice (IARC 1979, USEPA 1980). Chloroform is classified in EPA's Group B2 (probable human carcinogen) based upon sufficient evidence of carcinogenicity in animals and inadequate epidemiological evidence (USEPA 1985b).

An increased incidence of fetal abnormalities was reported in offspring of pregnant rats exposed to chloroform by inhalation at levels of 100 and 300 ppm, with 30 ppm being a no effect level. Oral doses of chloroform that caused maternal toxicity produced relatively mild fetal toxicity in the form of reduced birth weights. There are limited data suggesting that chloroform has mutagenic activity in some test systems. However, negative results have been reported for bacterial mutagenesis assays.

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1,1-DICHLOROETHANE

The major uses of 1,1 Dichloroethane (1,1-DCA) are as a solvent for plastics, oils and fats; as a cleaning agent; and as a degreaser. It is also used as a fumigant and insecticide spray, in fire extinguishing, and was formerly used as an anesthetic.

1,1-Dichloroethane is released as fugitive emissions during its production and use as a chemical intermediate, coupling agent in antiknock gasoline, paint and varnish remover, metal degreaser, and ore floatation agent (Verschueren, 1983). Its largest industrial use is in the production of 1,1,1-trichloroethane (Othmer, 1979). Another source of 1,1-dichloroethane in the environment is reduction of 1,1,1-trichloroethane to 1,1-dichloroethane in groundwater (Parsons et al, 1985; Delfino et al, 1989). This transformation is biotic and abiotic and is influenced primarily by temperature; half-life of trichloroethane is 10.2 months at 25 deg C and 4.5 yrs at 15 deg C (Delfino et al, 1989). 1,1-dichloroethane (ethylidene dichloride) is about one-half as toxic as 1,2-dichloroethane. (Thienes et al, 1972)

Recent chronic studies indicate that 1,1-dichloroethane has little capacity for causing liver damage being similar to methylene chloride & 1,1,1-trichloroethane in this respect. Rats, guinea pigs, rabbits & dogs were exposed to either 500 or 1000 ppm for 7 hr/day, 5 days/wk, for 6 mo. Gross & microscopic pathological studies showed no evidence of changes attributable to the exposure. (ACGIH, 1986)

When fed by gavage to B6C3F1 mice & Osborne-Mendel rats in the NCI bioassay program for a period of 78 weeks followed by an observation period of 33 weeks (rats) and 13 weeks (mice), survival was poor. The doses fed were very high, 764 and 382 mg/kg/day for male rats; 950 and 475 mg/kg/day for female rats; 2885 and 1442 mg/kg/day for male mice; and 3331 and 1665 mg/kg/day for female mice. It was reported there was no conclusive evidence for the carcinogenicity of 1,1-dichloroethane in Osborne-Mendel rats or B6C3F1 mice, although marginal increases in mammary adenocarcinomas and hemangiosarcomas were noted in female rats and a statistically significant increase in the incidence of endometrial stromal polyps occurred in female mice. (Clayton et al, 1981)

A risk assessment for 1,1-DCA is under review by an EPA work group, therefore a reference dose for chronic oral exposure (RfD) and a reference concentration for chronic inhalation exposure (RfC) is not yet available. The EPA Weight-of-Evidence Classification as to Human Carcinogenicity is "C", possible human carcinogen. This is based on no human data and limited evidence to carcinogenicity in two animal species (rats and mice) as shown above by an increased incidence of mammary gland adenocarcinomas and hemangiosarcomas in female rates and an increased incidence of hepatocellular carcinomas and benign uterine polyps in mice.

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1,1-DICHLOROETHYLENE

1,1 Dichloroethylene (1,1-DCE), or vinylidene chloride, is a common intermediate in the manufacture of polymers. 1,1-DCE polymers are widely used as coatings on the interiors of railroad cars, fuel storage tanks, and ship tanks, and on steel pipes and structures.

The chemical is highly volatile. 1,1-DCE is expected to be short-lived in water because of its poor solubility and rapid volatilization. Its half-life in surface water is estimated at 1 to 6 days, depending on aeration rates. Its volatility and poor solubility probably prevents absorption of significant quantities through skin.

Data on acute oral toxicity in animal studies, as measured by the LD_{50} (Lethal Dose) of 50 mg/kg to 1800 mg/kg in rats and 5750 mg/kg in dogs have been reported. Acute oral doses were found to produce numerous changes in liver and plasma enzymes as well as cell damage in liver and the bronchial epithelium.

Chronic (2-year) oral exposures via drinking water at 1,1-DCE concentrations of 50, 100, or 200 mg/l produced signs of liver pathology in rats. Chronic renal inflammation was observed in rats given 5 mg/kg/day by gavage for 2 years, and liver necrosis has been produced in mice exposed to 10 mg/kg/day by gavage, 5 days/week for 2 years. No adverse effects were observed at lower doses.

Acute inhalation toxicity in rats, measured as LC_{50} (Lethal Concentration) following 4 hours of exposure, also varied with whether the animal was fed (15,000 ppm) or fasted (600 ppm). Results from other studies are variable. For example, rabbits, monkeys, rats, and guinea pigs exposed to 395 mg/m^3 (100 ppm) for 8 hours/day, 5 days/week for 6 weeks exhibited no mortality, signs of toxicity, or histopathological (tissue) changes. Several studies have demonstrated that species, strain, and sex greatly influence the acute toxic effects of 1,1-DCE.

Longer term inhalation exposures, either continuous (47 ppm, 90 days) or intermittent (50 to 100 ppm, 8 hours/day, 5 days/week for 6 months), have been shown to produce liver, kidney, and lung damage in some animals.

If microsomal activation is provided, 1,1-DCE is weakly mutagenic in some bacterial systems, but not in Chinese hamster cells or in mice and rats. The International Agency for Research on Cancer has concluded that the evidence is sufficient to classify 1,1-DCE as a mutagen.

Studies of carcinogenic effects have variable results. Several long-term studies in rats failed to produce any evidence of carcinogenicity, but increased incidence of kidney and mammary tumors have been reported in Swiss mice. However, the tumors may be the result of tissue injury and repair rather than the result of mechanisms involving DNA.

Based on the lack of evidence of carcinogenicity in humans, limited animal data, and the mutagenicity observed in bacterial systems, EPA has classified 1,1-DCE as a possible human carcinogen (Class C). EPA has published an oral slope factor of 6E-1

$(mg/kg/day)^{-1}$ and a drinking water unit risk of 1.75E-5 $(\mu g/l)^{-1}$ based on a National Toxicology Program study that showed no increase in rat adrenal tumors at doses equivalent to a human intake of 0.6 mg/kg/day. The inhalation slope factor of 1.2E+00 $(mg/kg/day)^{-1}$ is based on increased incidence of kidney tumors in Swiss mice exposed to 10 and 25 ppm (MTD) for 4 to 5 days/week for 12 months. This slope factor is based on metabolized dose. The inhalation slope factor based on applied dose, derived from EPA's inhalation unit risk of 5.0E-5 $\mu g/m^3$ is 1.75E-1 $(mg/kg/day)^{-1}$ [5.0E-5 $\mu g/m^3 \div 70\ kg^{-1}$ BW x (20 m^3 air/day) x ($10^{-3}mg/\mu g$)].

EPA reports an RfD for chronic oral exposure of 9E-03 (mg/kg/day) based on the lowest observed adverse effect level of 9 mg/kg/day (50 ppm) producing hepatic lesions in rats fed 1,1-DCE in drinking water for 2 years. An RfD for the inhalation exposure route is not yet available.

	Toxicity		Carcinogenicity	
Exposure Route	Subchronic RfD	Chronic RfD	Slope Factor	EPA Weight of Evidence Category
	(mg/kg-day)	(mg/kg-day)	$(mg/kg/day)^{-1}$	
Inhalation	ND	ND[a]	1.2E +00[b,c]	C
Oral	9E - 03	9E - 03[d]	6.1E - 01[b]	C

a Under review by the RfC/RfD workgroup.
b Verified, available on IRIS.
c Based on route-to-route extrapolation.
d The oral RfD, while still available on IRIS, is being reconsidered by the RfD/RfC workgroup.

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1,2-DICHLOROETHENE

The compound 1,2-Dichloroethene (1,2-DCE) is a major degradation product of trichloroethene (TCE), and is also used in the manufacture of certain plastics. There are two forms of this compound, cis-1,2-DCE, and trans-1,2-DCE. Both forms are toxic at relatively high concentrations. In general, both of the 1,2-DCE isomers are less toxic than the other isomer of dichloroethene, 1,1-dichloroethene (1,1-DCE).

Because of the volatility of 1,2-DCE, inhalation is expected to be the major route of uptake under most circumstances (Reichart et al., 1979), although uptake via ingestion may also be significant (Dallas et al., 1983). Absorption of 1,2-DCE in the body is fairly rapid and complete (Reichart et al., 1979; Dallas et al., 1983). Dermal exposure is generally considered a minor route for 1,2-DCE uptake, although its physicochemical properties suggest that it could be absorbed dermally.

The acute toxicity of both cis- and trans 1,2-DCE has been investigated, although most work has emphasized trans-1,2-DCE. One human fatality has been reported (Hamilton, 1934) in response to exposure to a mixture of DCE isomers at an unknown concentration. The LC_{50} for trans-1,2-DCE in mice has been reported to be quite high, at 21,723 ppm (Gradiski et al., 1978). The oral toxicity of 1,2-DCE is also relatively high, ranging from 1,275 to 7,900 mg/kg in rats (Freundt et al., 1977; Hayes et al., 1987) and from 1,000 to 2,200 mg/kg in mice (Kallman et al., 1983; Munson et al., 1982; Barnes et al., 1985).

The major target organs for sublethal doses of DCE are the liver and kidney, with some involvement of the CNS, heart, and lung. Central nervous system effects in man have been reported for acute exposure to trans-1,2-DCE (Lehmann and Schmidt-Kehl, 1936). Effects include CNS depression, fatigue, drowsiness, and nausea. The CNS effects appear to be reversible. The CNS and cardiovascular effects in animals have only been reported for acute exposures to very high doses of trans-1,2-DCE (Freundt et al., 1977).

The liver is also a primary organ of both isomers of 1,2-DCE. Numerous animal studies have demonstrated histological changes and changes in liver enzymes in response to trans-1,2-DCE (Tierney et al., 1979; Freundt et al., 1977; Barnes et al., 1985). Histological changes are typically characterized by fatty changes in the liver.

One study by Hayes et al. (1987) reported that trans-1,2-DCE caused an increase in kidney organ weight without any associated histological changes. The kidney appears not to be a primary target organ of 1,2-DCE. No reproductive or teratogenic effects of 1,2-DCE exposure have been reported.

Some evidence exists to suggest that 1,2-DCE is a mutagen. Exposure to cis-1,2-DCE, but not trans-1,2-DCE, was shown to induce chromosomal abnormalities in mouse bone marrow (Cerna and Kypenova, 1977) and was also mutagenic in two host-mediated assays (Cerna and Kypenova, 1977; Bronzetti et al., 1984). No carcinogenicity studies on either cis- or trans-1,2-DCE are reported.

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TETRACHLOROETHYLENE

The major uses of tetrachloroethylene (perchloroethylene, PCE) are in commercial dry cleaning and metal degreasing. It also has minor use in products for home use and veterinary anti-helminthics.

Excessive exposure to PCE has resulted in effects on the central nervous system, mucous membranes, eyes and skin, and to a lesser extent the lungs, liver, and kidneys. Lack of coordination is usually the first effect observed at low concentrations. Dizziness, headache, vertigo, or mild narcosis have occurred in many instances after occupational exposures.

Several studies of the effects of prolonged exposure to perchloroethylene vapors on human volunteers are available (Row et al., 1952, 1963; Stewart et al., 1974, 1977; Monster, 1978). The most comprehensive studies are by Stewart et al., but others have reached similar conclusions. Prolonged exposure to PCE vapors at 200 ppm results in early signs of CNS depression, however, there was no response in men or women repeatedly exposed to 100 ppm for 7 hours/day. Clinical chemical studies indicate no liver or kidney effects at these levels.

Toxic effects in liver have been demonstrated in several animal studies. Bubena 2nd O'Flaherty (1985) exposed mice to PCE in corn oil by gavage at doses of 20, 100, 200, 500, 1500, and 2000 mg/kg, 5 days/week for 6 weeks. Increased liver triglycerides were first observed in mice treated with 100 mg/kg. Liver weight/body weight ratios were significantly higher than controls for animals treated with 100 mg/kg. At higher doses, hepatotoxic effects included decreased DNA content, disturbed enzyme activities, and hepatocellular necrosis, degeneration, and polyploidy.

A no-observed-effect level (NOEL) of 14 mg/kg/day was established in a second study (Hayes et al., 1986). Rats were administered doses of 14,400 or 1400 mg/kg/day in drinking water. Males in the high-dose group and females in the two highest groups exhibited depressed body weights. Equivocal evidence of hepatotoxicity (increased liver and kidney weight/body weight ratios) were also observed at the higher doses.

Other data support the findings of the principal studies. Exposure of mice and rats to tetrachloroethylene by gavage for 11 days caused hepatotoxicity (centrilobular swelling) at doses as low as 100 mg/kg/day in mice (Schumann et al., 1980). Mice were more sensitive to the effects of tetrachloroethylene exposure than rats. Increased liver weight was observed in mice at 250 mg/kg, however, rats did not exhibit these effects until doses of 1000 mg/kg/day were reached. Relative sensitivity to man cannot be readily established but the oral RfD of 1E-2 mg/kg/day is protective of the most mild effects observed in humans [diminished odor perception/modified Romberg test scores in volunteers exposed to 100 ppm for 7 hours; roughly equivalent to 20 mg/kg/day (Stewart et al., 1961)].

The principal studies are of short duration. Inhalation studies have been performed which indicate that the uncertainty factor (UF) of 10 is sufficient for extrapolation of the subchronic effect to its chronic equivalent. Liver enlargement and vacuolation of hepatocytes were found to be reversible lesions for mice exposed to low concentrations of tetrachloroethylene (Kjellstrand et al., 1984). In addition, elevated liver weight/body weight ratios observed in animals exposed to tetrachloroethylene for 30 days were similar to those in animal exposed for 120 days. Several chronic inhalation studies have also been performed (Carpenter, 1937; NTP, 1985; Rowe et al., 1952). None are inconsistent with a NOAEL of 14 mg/kg/day for tetrachloroethylene observed by Buben and O'Flaherty (1985) and Hayes et al., (1986).

	Toxicity		Carcinogenicity	
Exposure Route	Subchronic RfD	Chronic RfD	Slope Factor	EPA Weight of Evidence Category
	(mg/kg-day)	(mg/kg-day)	$(mg/kg/day)^{-1}$	
Inhalation	ND	ND	1.8E - 03[a]	B2
Oral	1E - 01	1E - 02[b]	5.1E - 02[c]	B2

Source: Integrated Risk Information System (December 1990)

[a] Calculated slope factor by HEAST methodology from unit risk (ugt/m^3 or ug/l).

[b] Verified, available on IRIS.

[c] CRAVE-EPA group verified, pending input into IRIS. Quantitative estimates were not calculated by the CRAVE workgroup.

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CHEMICAL SUMMARY

1,1,1-TRICHLOROETHANE
(CAS NO. 71-55-06)

1,1,1-trichloroethane (1,1,1-TCE) is a liquid with a molecular weight of 133.4, a boiling point of 74.1°C and a melting point of -32.6°C. In water, the compound has both a detectable taste (at 500 ppm) and a detectable odor (at 50 ppm). Its solubility in water is 4000 ppm at 20°C. 1,1,1-TCE is narcotic and has been used as an anesthetic. However, 1,1,1-TCE is used primarily in industry as a cold cleaning solvent for plastic molds, electric motors, generators and electronic equipment. A high purity grade of 1,1,1-TCE has been used for cleaning semi-conductors, high vacuum equipment and missile parts. Agricultural uses of 1,1,1-TCE include the degreening of citrus fruits and the post harvest fumigation of strawberries.

With a Henry's constant of 1.1×10^{-2} volatilization is considered to be the major mode of transport for 1,1,1-TCE. 1,1,1-TCE will also sorb to sediment, a process which competes with volatilization. Laboratory measurements with 200 rpm stirring demonstrated a volatilization half life of 17-23 minutes. 1,1,1-TCE will undergo microbial degradation only under anaerobic conditions and is not expected to undergo hydrolysis or photolysis. Microcosm studies have revealed the overall half life to be 11-24 days, which was not changed when biodegradation was halted or when light was restricted, thus the fate of the compound is dominated by volatilization.

When considering acute lethality, via oral or inhalation exposure, 1,1,1-TCE is considered relatively nontoxic. For rats, mice, rabbits and guinea pigs reported oral LD50s (single oral dose that results in 50% mortality of a test population) ranged from 10.3-14.3, 9.7-11.2, 5.7-10.5, and 8.6-9.5 gm/kg body weights, respectively. Inhalation LC50s (vapor concentration that results in 50% mortality of a test population) ranged from 56,000 to 135,000 ug/1 following 1 to 6 hours exposure to rats and mice. At 4-hour inhalation LC50 of 97,200 ug/1 has been reported for rats.

Symptoms of acute 1,1,1-TCE exposure include central nervous system depression, liver and kidney damage, and cardiac effects in laboratory animals. When dogs were exposed to 2700 ug/1 or more there were decreases in leukocyte counts which were reversible following cessation of treatments. There was also a decrease in arterial blood pressure in dogs exposed to 1,1,1-TCE. Dermal exposure of guinea pigs resulted in body weight loss and pathologic alterations (karyopyknosis, karyolysis, junctional separation, etc.) at the site of application. Following inhalation exposure to 1,1,1-TCE mice experienced decreased concentrations of cGMP of the cerebellum, brain stem and cerebral cortex.

Acute exposure of humans to 1,1,1-TCE has resulted in CNS depression and disorientation, liver, spleen, kidney and brain congestion, and death at high concentrations (especially with improper ventilation in confined spaces). Eye irritation, dermatitis and epidermal delipidation have also been observed in humans following acute dermal or vapor exposure.

Chronic exposure to toxic concentrations of 1,1,1-TCE has caused CNS depression, liver and kidney damage, body weight loss or reduced weight gain, and death in laboratory animals. Rats and mice experienced increased mortality at oral doses of 750 and 2800 mg/kg/day, respectively. Rats administered 410 mg/kg/day via inhalation and alteration in WBC counts. Rats dermally exposed to 280 mg/kg had reduced weight gain and liver damage. Guinea pigs lost weight at 530 mg/kg/day (inhalation) and astrogliomas, indicative of brain tissue damage, was induced at 1300 mg/kg/day. Monkeys and dogs suffered liver damage at 640 and 900 mg/kg/day (inhalation), respectively.

Chronic exposure of humans to 1,1,1-TCE has resulted in neurological, hepatic, gastrointestinal, cardiovascular and hematologic disorders. Eye irritation, fatigue and death have also been reported.

The International Agency for Research on Cancer has been unable to make a determination on the carcinogenicity of 1,1,1-TCE due to the paucity of cancer data. However, NIOSH recommends that 1,1,1-TCE be closely monitored for carcinogenic effects in humans and laboratory animals.

A 1977 bioassay conducted by the National Cancer Institute with Osborne-Mandel rats and B6C3F1 mice was inconclusive for both species due to excessive mortality. A 1983 National Toxicology Program bioassay with F344 rats and B6C3F1 mice has provided preliminary positive data for liver tumors. However, the results of this bioassay are currently being reviewed and, thus, are not available in final form as of this writing. When rats were exposed to 875 and 1750 ppm 1,1,1-TCE via inhalation for 12 months a variety of neoplasms were observed in all groups, including controls, but were not attributed to the test compound by the authors. An increase in leukemias was observed following daily dosing of rats with 500 mg/kg but the design of the experiment did not allow definite conclusions to be made. In a BALVB/C-3T3 cell transformation assay 1,1,1-TCE resulted in a dose-dependent positive response. However, a second transformation assay with baby hamster kidney cells gave conflicting positive and negative responses.

Assays testing the mutagenicity potential of 1,1,1-TCE have provided conflicting data, though the majority of the tests have been negative. Ames assays with Salmonella, forward and reverse mutation assays with yeast, cytogenetic assays with rat and mouse bone marrow cells, sex-linked recessive lethal assays with Drosophila, DNA damage assays with bacteria, yeast and mammalian cells, and prophage induction tests using E. Coli have frequently been negative. A dominant lethal assay conducted in conjunction with a multigeneration reproductive study did not induce mutations in either of two generations of mice tested. However, several Ames assays have been positive with Salmonella strains TA100 and TA1535. Viral enhancement assays with Syrian hamster cells have been positive. Positive results have been occasionally observed in DNA damage assays with E. Coli. Some of these same assays types, along with sister chromatid exchange assays, have resulted in weakly positive or questionable responses. Assays for sperm head abnormalities have been negative. Transformation assays with baby hamster kidney cells have generally been negative though some have been weakly positive. An assay evaluating covalent binding to macromolecules has shown 1,1,1-TCE to have a low potential for DNA binding, approximating that of very weak initiators.

In a multigeneration reproductive/developmental assay mice were exposed to 1,1,1-TCE concentrations up to 5.83 mg/ml in their drinking water (equivalent to 1000 mg/kg/day) without adverse effects on fertility, gestation, viability, or lactation, nor were terata induced. However, when female rats were exposed, via inhalation, prior to and/or during skeletal and soft tissue anomalies and decreased fetal weights. Visceral injection of 0.7-13.0 mg 1,1,1-TCE/egg.

1,1,1-TCE was found to be acutely toxic to several freshwater species. The 96 hr. LC50 for the fathead minnow ranged from 52.8 mg/1 to 105.0 mg/1. The 48 hr EC50 for the macroinvertebrate Daphnia magna was 530 mg/1.

A bioconcentration factor of 9 has been determined for the bluegill.

CHEMICAL SUMMARY

1,1,2-TRICHLOROETHANE
(CAS NO. 79-00-5)

1,1,2-Trichloroethane is prepared by the catalytic chlorination of ethane or ethylene. It is used as a solvent for fats, waxes, natural resins, and alkaloids. However, the availability of other less toxic solvents discourages its use.

Routes of exposure for 1,1,2-trichloroethane include inhalation and ingestion. It can also be absorbed through the skin.

1,1,2-Trichloroethane vapor is a potent narcotic. Injury to lungs, liver, and kidneys has been observed in animals. The lethal concentration for rats was 2,000 ppm for 4 hours. Concentrations resulting in narcosis also caused irritation of the nose and eyes. Mice treated by intraperitoneal injection with anesthetic doses showed moderate hepatic dysfunction and renal dysfunction. At necropsy, there was centrilobular necrosis of the liver and tubular necrosis of the kidney. No human cases of intoxication or systemic effects from industrial exposure have been reported.

No information was found concerning the reproductive toxicity or teratogenicity of 1,1,2-trichloroethane. No chronic studies were found other than the carcinogenesis bioassay identified above which addressed the toxicity of 1,1,2-trichloroethane, however, single doses as low as 400 mg/kg caused liver and kidney damage in dogs. The oral LD_{50} (Lethal Dose) value for 1,1,2-trichloroethane in rats is 835 mg/kg.

1,1,2-Trichloroethane was not mutagenic when tested in Salmonella (NTP 1985). However, it induced hepatocellular carcinomas and pheochromocytomas of the adrenal glands following oral exposure (78 weeks) in male and female mice but did not produce a significant increase in tumor incidence in male or female rats (NCI 1977). EPA has classified 1,1,2-trichloroethane as a Group C (possible human) carcinogen based on positive evidence in mice and an absence of data on humans.

	Toxicity		Carcinogenicity	
Exposure Route	Subchronic RfD	Chronic RfD	Slope Factor	EPA Weight of Evidence Category
	(mg/kg-day)	(mg/kg-day)	$(mg/kg/day)^{-1}$	
Inhalation	ND	ND[a]	5.7E - 02[b,c]	C
Oral	4E - 02	4E - 03[b]	5.7E - 02[b]	C

Source: Health Effects Assessment Summary Tables (EPA, 1991)

[a] Under review by RFD/RFC workgroup.

[b] Verified, available on IRIS.

[c] Based on route-to-route extrapolation.

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CHEMICAL SUMMARY

TRICHLOROETHYLENE (TCE)
(CAS NO. 79-01-6)

TCE is an industrial solvent that is potentially toxic at relatively high concentrations. Because of its high volatility, inhalation is a primary route of exposure under most circumstances. Absorption of TCE from the lung reportedly ranges from 36 to 75 percent and from 93 to 98 percent from the gastrointestinal tract (ATSDR 1989). Dermal absorption is generally poor, although the defatting action of TCE can enhance its uptake.

Several studies have investigated the acute toxicity of TCE in experimental animals. Inhalation studies indicate that the LD_{50} (Lethal Dose) for a single 4-hour exposure to TCE is about 12,500 ppm in rats (Siegel et al., 1971) and 8,450 ppm in mice (Kylin et al., 1962). Oral LD_{50} values have been reported for cats (5,864 mg/kg; NIOSH 1984), rats (4,920 mg/kg; Smyth et al., 1969), and mice (2,400 mg/kg; Tucker et al., 1982).

Human data concerning acute TCE toxicity are more limited and have been collected from reported accidental deaths in industrial settings following exposure to 1,000 ppm or more.

A large body of literature exists on the sublethal effects of TCE. The primary target organs include the central nervous system (CNS), liver, kidneys, as well as bone marrow. The most sensitive target organ appears to be the CNS. In humans, inhalation of TCE at concentrations as low as 27 ppm reportedly caused headaches (Nomiyama and Nomiyama, 1977). Inhalation of TCE at a concentration of 110 ppm for 8 hours affected perception, memory, and dexterity (Salvini et al., 1971), whereas higher concentrations (956 to 2,000 ppm) for shorter time periods (2 to 3.5 hours) had no apparent CNS effects (Vernon and Ferguson, 1969; Ettema et al., 1975; Konietzko, et al., 1974).

Animal studies have demonstrated that behavioral changes occur in rats exposed to TCE at 100 ppm in air for 5 days (Silverman and Williams, 1975). Changes in brain RNA concentrations occurred when rats were exposed to 200 ppm for 5 days (Savolainen et al., 1977). Kjellstrand et al., (1981, 1983) have reported that inhalation of TCE at 150 ppm for 2 to 9 days caused an increase in liver and kidney weight. Cellular changes associated with these weight increases in the liver included hepatocellular hypertrophy and vacuolization, but these did not appear to be associated with liver injury. Other effects on experimental animals included the alteration of enzymes involved in heme synthesis (Fujita et al., 1984), a decrease in leukocyte count (Hobara et al., 1984), and effects on hemoglobin, hematocrit, and erythroblasts (Nomiyama et al., 1986). Relatively high oral doses caused kidney damage (at 500 mg/kg) and liver necrosis (at 2,400 mg/kg) (Stott et al., 1982).

There is some evidence that high levels of TCE may affect the reproductive system. Land et al., (1979, 1981) reported that exposure to 2,000 ppm in air caused an increase in sperm abnormalities. Several developmental effects have also been attributed to TCE. Exposure to air concentrations of 100 ppm during pregnancy has been linked to decreased fetal weight, increased embryonic resorptions, and incomplete bone ossification in rats (Healy et al., 1982). However, epidemiological studies of women exposed to TCE in the work place have failed to demonstrate any developmental or reproductive effects in humans (Tola et al., 1980).

Despite numerous epidemiological studies, no statistically significant increases in cancer have been observed in connection with either occupational inhalation exposures (Axelson et al., 1978; Tola et al., 1980; Malek et al., 1979) or residential well-water exposures (Lagakos et al., 1986) to TCE. The lack of evidence in humans for carcinogenicity is significant given the extensive history of TCE usage in industry. Some evidence exists that TCE may be a weak mutagen (USEPA, 1985). However, this work was based on commercial-grade TCE and co-contaminants present may have been responsible for the observed effects.

Maltoni et al., (1988) have reported that inhalation of TCE caused an increased incidence of testicular carcinomas in rats and lung adenomas and hepatomas in mice. Oral exposure has been related to hepatocellular carcinomas in mice (NCI, 1976) and renal adenocarcinomas (NTP, 1986) and leukemia (Maltoni et al., 1988) in rats. The EPA has classified TCE as a Class B2 potential human carcinogen based on animal studies.

	Toxicity		Carcinogenicity	
Exposure Route	Subchronic RfD	Chronic RfD	Slope Factor	EPA Weight of Evidence Category
	(mg/kg-day)	(mg/kg-day)	$(mg/kg/day)^{-1}$	
Inhalation	pending	pending	1.7E-02[a,b]	B2
Oral	pending	pending	1.1E-02[a]	B2

Source: Integrated Risk Information System (December 1990)

[a] Values removed from IRIS pending further review; new verified values are pending input into IRIS.

[b] Based on metabolized dose.

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ATTACHMENT F

SOIL ANALYTICAL RESULTS

June 10, 1988

Mr. Nicholas Hale
CMW, Inc.
70 South Gray Street
P.O. Box 2266
Indianapolis, Indiana 46206

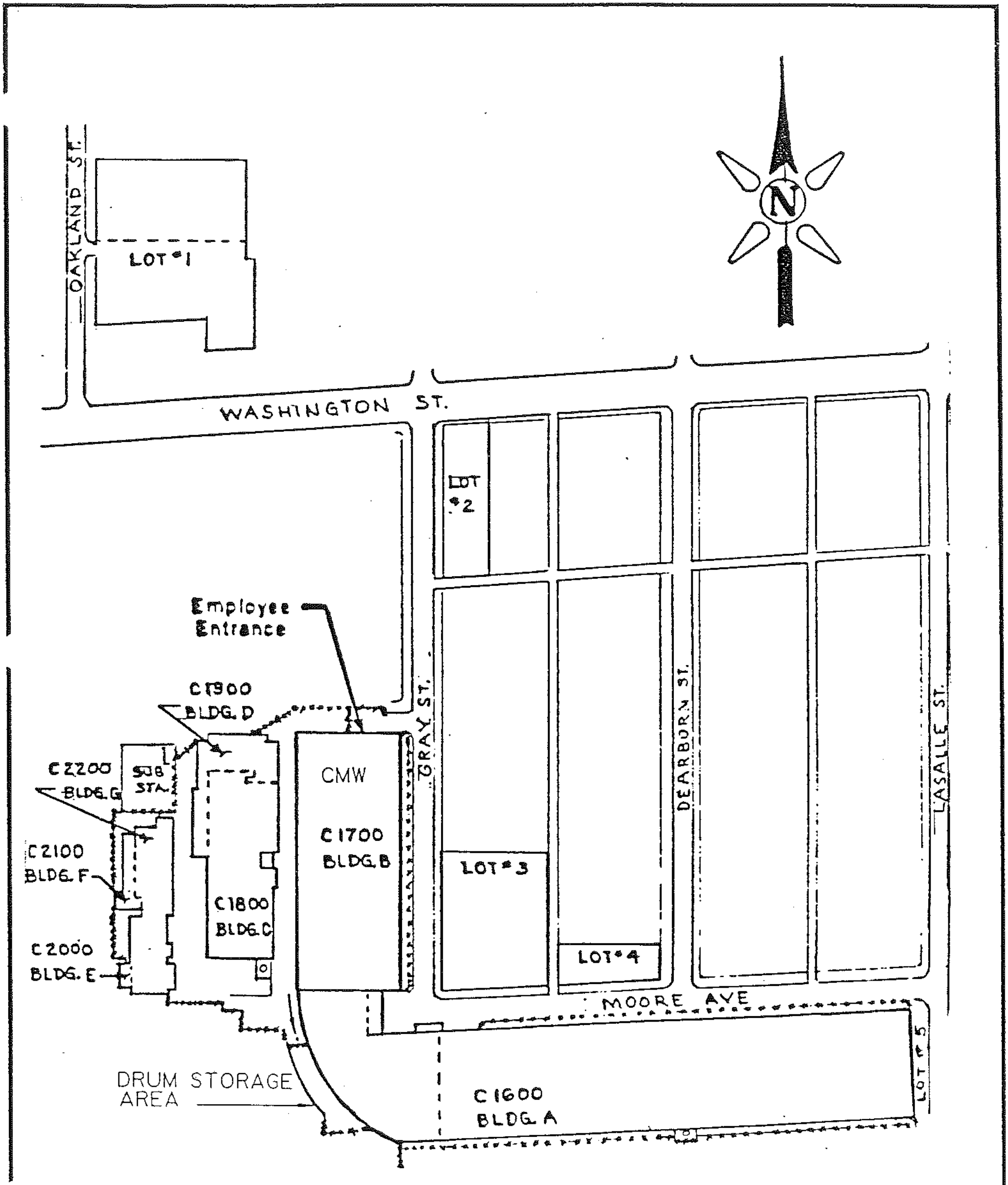
Re: Sampling and Analysis Report
CMW, Inc. Drum Storage Area
Indianapolis, Indiana
ATEC Project Number 21-87176

Dear Mr. Hale:

Pursuant to our ATEC Proposal Number PE-88151 dated May 4, 1988 regarding additional sampling and analyses from the CMW, Inc. Drum Storage Area, ATEC Environmental Consultants (ATEC) herewith submits the results of our laboratory analyses from samples collected.

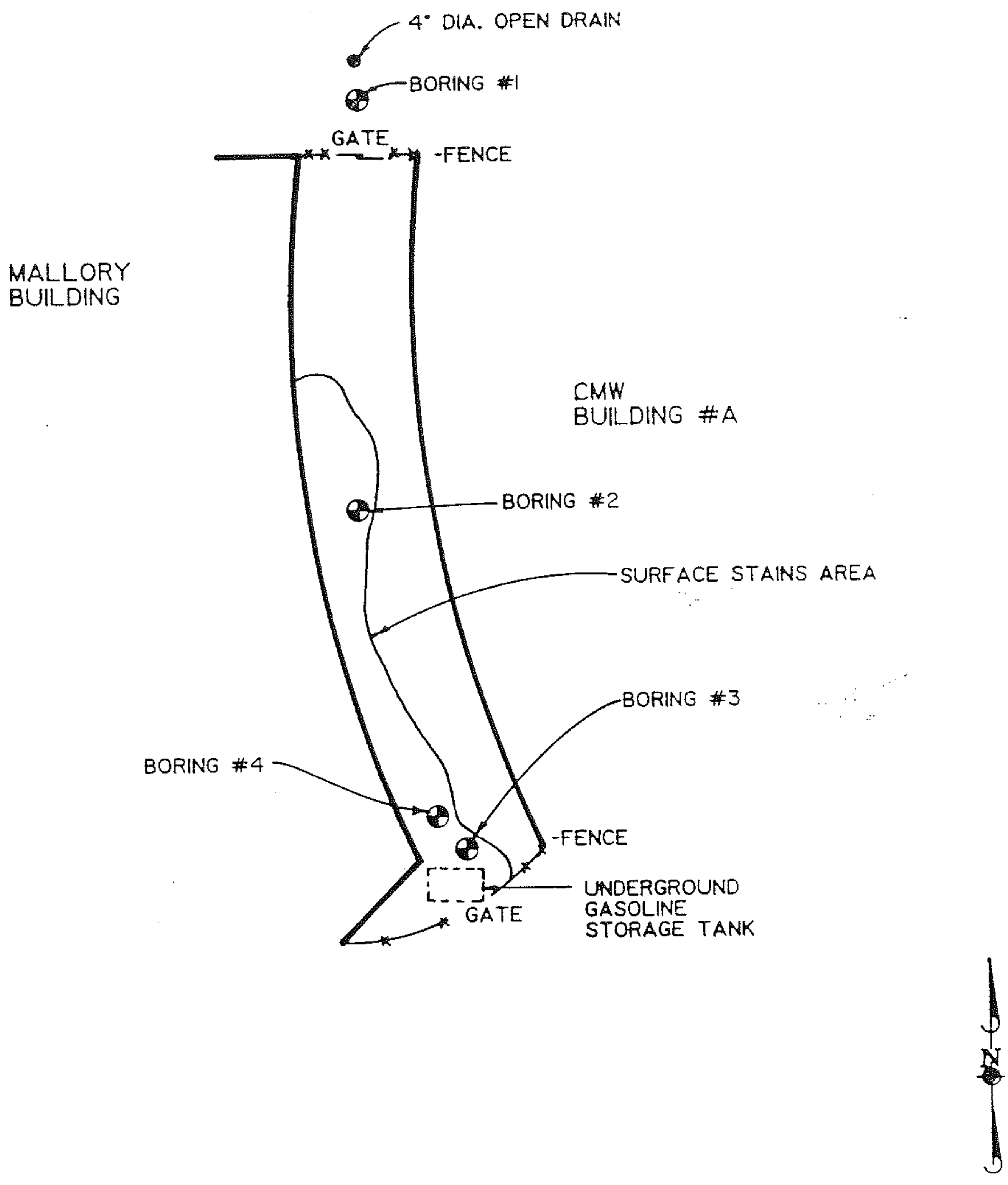
INTRODUCTION

ATEC analyzed soil samples from BH-2 (Location) shown in Figure 1 for total cadmium concentration. We also collected soil samples from a new boring identified as BH-4 location as shown in Figure land 2). Samples in this boring were collected at 6 in., 12 in and 18 in. depths and were analyzed for volatile organic compounds (VOCs). All work was performed in accordance with IDEM and U.S. EPA guidelines regarding QA/QC sampling and analyses procedures. Analytical results from the work done is reported for total cadmium concentration in boring BH-2 in Table 1. These cadmium levels appear to be at acceptable concentrations with the full analytical results found in Attachment A.



PROJECT SITE CMW, INC. DRUM STORAGE AREA INDIANAPOLIS, IN	PROJECT NO. 21-87176 SCALE 1" = 150' FIGURE NO. 1

ATEC



SAMPLE BORINGS
CMW, INC.
INDIANAPOLIS, IN

PROJECT NO. 21-87176	ATEC
SCALE 1" ~ 25'	
FIGURE NO. 2	

Table 1
Total Cadmium Concentration

Borehole BH-2

Sample	Sample Depth, (in.)	Total Cadmium Concentration (ppm)
BH-2-B	12	0.80
BH-2-C	18	0.40
BH-2-D	24	0.50
BH-2-E	30	0.70
BH-2-F	36	0.50

Analytical results for VOCs are reported for boring BH-4 as follows:

Table 2

Detected Volatile Organic Compounds

Borehole BH-4

Sample	Sample Depth (in.)	Volatile Organic Compound	Total Concentration (ppm)
BH-4-A	6	trichloroethylene	0.096
		tetrachlorethylene	0.039
BH-4-B	12	1,1-dichloroethylene	0.180
		1,1-dichloroethane	0.260
		trans-1,2-dichloroethylene	4.9
		chloroform	0.630
		1,1,1-trichloroethane	5
		trichloroethylene	48
		tetrachloroethylene	2.2
BH-4	18	Acetone	0.20
		1,1-dichloroethylene	0.75
		1,1-dichloroethane	0.59
		trans-1,2-dichloroethylene	1.30
		chloroform	0.071
		1,1,1-trichloroethane	0.51
		trichloroethylene	2.40
		tetrachlorethylene	0.25

EVALUATION CRITERIA LIMITS

Since there are no universally accepted clean-up standards relating to concentrations of VOCs in soils, the various methods by which the IDEM has approved decontamination in the past have been revised. However, our experience with the IDEM enforcement procedures involving remedial action has shown that soils with concentrations of 1 ppm or greater chlorinated solvents were required to be cleaned up. Since the levels of chlorinated solvents found in BH-4 exceed 1 ppm, ATEC is recommending remediation of the site to remove these contaminated soils. However, prior to contaminated soil removal from this site, additional sampling and analysis is recommended to define the horizontal and vertical extent of VOC contamination.

The standard which ATEC believes to be most representative of acceptable clean-up levels involves the use of the limits established by the "Toxicity Characteristic Leaching Procedure" (TCLP). The limits for certain contaminants as proposed in the U.S. EPA modification to 40 CFR Part 261, found in the June 13, 1986 Federal Register is found in Table 3 as follows:

Table 3

TCLP Limits for Contaminants

Detected in the CMW, Inc. Drum Storage Area

Contaminant	TCLP Limit (ppm)
1,1-dichloroethylene	0.10
1,1-dichloroethane	0.40
chloroform	0.07
1,1,1-trichloroethane	30
trichloroethylene	0.07
tetrachlorethylene	0.10

CONCLUSIONS AND RECOMMENDATIONS

A comparison of analytical results with the TCLP limits indicates that certain contaminants were detected above the TCLP limits.

It is recommended that those areas showing contaminant levels above the established criteria limits for this project be removed offsite, transported and properly disposed of according to all U.S. EPA and IDEM approved procedures.

The TCLP procedure involves measuring a contaminant concentration following an extraction procedure similar to that used for

EP-toxicity testing which is designed to simulate leaching of a contaminant from the waste following disposal. Although the VOC measurements provided during this investigation are total concentrations rather than TCLP concentrations (i.e., leachable conentrations), it is believed that if total concentrations are below the TCLP concentrations, then these levels would not represent a threat to human health or the environment. However, analytical results show total concentrations to be greater than the proposed TCLP levels, therefore ATEC recommends remediation of the contaminated materials. Appropriate arrangements will need to be made for the hauling of the waste material by an IDEM licensed hazardous waste transporter and to obtain approval for disposal of the waste material from a fully licensed hazardous waste landfill disposal facility in the State of Indiana. Clean landfill material will then be used to fill in the areas which have been excavated after determining that all contaminated soils have been properly removed. A complete proposal outlining all work to be performed during this project will be forwarded to you after receipt of this report.

Please feel free to contact us if you have any questions or comments.

Very truly yours,

ATEC Associates, Inc.

Noel L. Daniel
Staff Geologist, C.P.G.

Matthew C. Stokes, C.H.M.M.
Project Environmental Scientist

ATTACHMENT A

June 7, 1988

Mr. Noel Daniel
ATEC Environmental Consultants
5150 East 65th Street
Indianapolis, IN 46220

Re: Three Soil VOA; SW 846 Method 8240
Five Soil Cadmium; SW 846 Method 7130
CMW, Inc.
ATEC Project Number 21-87176

Dear Mr. Daniel:

Enclosed are the results of the Organic Analyses for the eight soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on May 18, 1988, on behalf of CMW, Inc. The volatile samples were analyzed on a Finnigan Incos 50 GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard. Cadmium was analyzed on a Varian SpectrAA-10 Atomic Absorption Spectrophotometer according to Method 7310 as outlined in SW 846.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

Samples will be held for a period of thirty days following the date of this report, after which re-analysis will require the submission of fresh samples. It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

Client: CMW, Inc.
Client Address: 70 South Gray Street
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: BH4-A
Sample Matrix: Soil
Date Sample Collected: May 18, 1988
Date Sample Received: May 18, 1988
Date Sample Analyzed: May 31, 1988

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 81220A

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5*	5
Acetone	67-64-1	<50*	50
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5*	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<50*	50
1,1,1-Trichloroethane	71-55-6	< 5*	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 81220A

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	96	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	39	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Sima
Verified: K. Kline
Date Reported: June 6, 1988

Respectfully submitted,

Keith S. Kline
Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 South Gray Street
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: BH4-B
Sample Matrix: Soil
Date Sample Collected: May 18, 1988
Date Sample Received: May 18, 1988
Date Sample Analyzed: May 31, 1988

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 81220B

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<53	53
Bromomethane	74-83-9	<53	53
Vinyl Chloride	75-01-4	<53	53
Chloroethane	75-00-3	<53	53
Methylene Chloride	75-09-2	<26*	26
Acetone	67-64-1	<260*	260
Carbon Disulfide	75-15-0	<26	26
1,1-Dichloroethene	75-35-4	180	26
1,1 Dichloroethane	75-35-3	260	26
Trans-1,2-Dichloroethene	156-60-5	4900	26
Chloroform	67-66-3	630	26
1,2-Dichloroethane	107-06-2	<26	26
2-Butanone	78-93-3	<260*	260
1,1,1-Trichloroethane	71-55-6	5000	26
Carbon Tetrachloride	56-23-5	<26	26
Vinyl Acetate	108-05-4	<53	53
Bromodichloromethane	75-27-4	<26	26
1,2-Dichloropropane	78-87-5	<26	26

* Analyte detected but amount present is less than the quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 81220B

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<26	26
Trichloroethene	79-01-6	48,000	26
Dibromochloromethane	124-48-1	<26	26
1,1,2-Trichloroethane	79-00-5	<26	26
Benzene	71-43-2	<26*	26
cis-1,3-Dichloropropene	10061-01-5	<26	26
2-Chloroethylvinylether	110-75-8	<53	53
Bromoform	75-25-2	<26	26
4-Methyl-2-Pentanone	591-78-6	<53	53
2-Hexanone	108-10-1	<53	53
Tetrachloroethene	127-18-4	2200	26
1,1,2,2-Tetrachloroethane	79-34-5	<26	26
Toluene	108-88-3	<26	26
Chlorobenzene	108-90-7	<26	26
Ethylbenzene	100-41-4	<26	26
Styrene	100-42-5	<26	26
Total Xylenes		<26	26

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Sima
Verified: K. Kline
Date Reported: June 6, 1988

Respectfully submitted,

Keith S. Kline
Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 South Gray Street
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: BH4-C
Sample Matrix: Soil
Date Sample Collected: May 18, 1988
Date Sample Received: May 18, 1988
Date Sample Analyzed: May 31, 1988

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 81220C

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<37	37
Bromomethane	74-83-9	<37	37
Vinyl Chloride	75-01-4	<37	37
Chloroethane	75-00-3	<37	37
Methylene Chloride	75-09-2	<19*	19
Acetone	67-64-1	200	190
Carbon Disulfide	75-15-0	<19	19
1,1-Dichloroethene	75-35-4	75	19
1,1 Dichloroethane	75-35-3	59	19
Trans-1,2-Dichloroethene	156-60-5	1300	19
Chloroform	67-66-3	71	19
1,2-Dichloroethane	107-06-2	<19	19
2-Butanone	78-93-3	<190*	190
1,1,1-Trichloroethane	71-55-6	510	19
Carbon Tetrachloride	56-23-5	<19	19
Vinyl Acetate	108-05-4	<37	37
Bromodichloromethane	75-27-4	<19	19
1,2-Dichloropropane	78-87-5	<19	19

* Analyte detected but amount present is less than the quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 82110C

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<19	19
Trichloroethene	79-01-6	2400	19
Dibromochloromethane	124-48-1	<19	19
1,1,2-Trichloroethane	79-00-5	<19	19
Benzene	71-43-2	<19*	19
cis-1,3-Dichloropropene	10061-01-5	<19	19
2-Chloroethylvinylether	110-75-8	<37	37
Bromoform	75-25-2	<19	19
4-Methyl-2-Pentanone	591-78-6	<37*	37
2-Hexanone	108-10-1	<37	37
Tetrachloroethene	127-18-4	250	19
1,1,2,2-Tetrachloroethane	79-34-5	<19	19
Toluene	108-88-3	<19	19
Chlorobenzene	108-90-7	<19	19
Ethylbenzene	100-41-4	<19	19
Styrene	100-42-5	<19	19
Total Xylenes		<19	19

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Sima
Verified: K. Kline
Date Reported: June 6, 1988

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

REPORT OF TEST RESULTS

ATEC Project Number 21-87176

DATE: June 7, 1988

CLIENT: CMW, Inc.
70 South Gray Street
P.O. Box 2266
Indianapolis, IN 46201

SAMPLE IDENTIFICATION: Cadmium Analysis
SAMPLE MATRIX: Soil
SAMPLE TAKEN BY: ATEC (ND)
DATE RECEIVED: May 18, 1988
ANALYST: TO

Parameter (units in mg/kg unless noted)	Sample I.D. Number BH-2B	BH-2C	BH-2D	BH-2E	BH-2F	MDL*	SW 846 Analytical Method No.
Total Metals							
Cadmium	0.8	0.4	0.5	0.7	0.5	0.5	7130

* Method Detection Limit

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline

Environmental/Analytical Testing Division

5-18-88

ATEC Associates, Inc.
(317) 849-4990

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
1-87176	CMW Sampling & Analysis

SAMPLERS: (Signature) Noel L. Daniel

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS
BH-2-B	5-18			X	BH-2-B	1							analyze for tot cadmium
BH-2-C	5-18			X	BH-2-C	1							" " " "
BH-2-D	5-18			X	BH-2-D	1							" " " "
BH-2-E	5-18			X	BH-2-E	1							" " " "
BH-2-F	5-18			X	BH-2-F	1							" " " "
BH-4-A	5-18			X	BH-4-A	1							analyze for VOC's only
BH-4-B	5-18			X	BH-4-B	1							" " " "
BH-4-C	5-18			X	BH-4-C	1							" " " "

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Noel L. Daniel	5-18-88 2:45 PM				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)

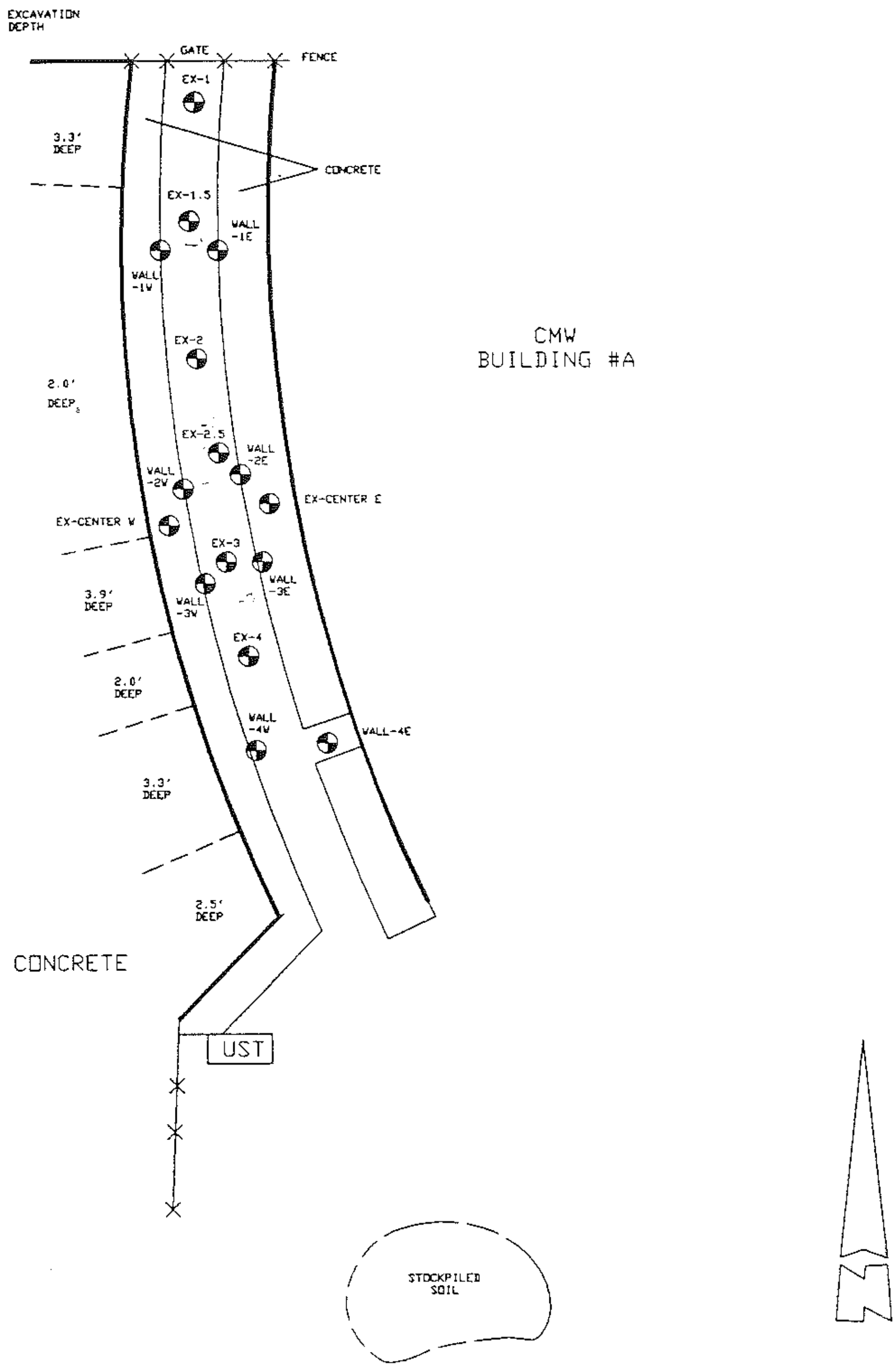
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
		Rebecca Rogers	5-18-88 2:45 PM	

2.0 FIELD METHODOLOGIES

The field activities were conducted in accordance with Federal and State approved field methodologies as outlined in SW-846 "Field Methods for Evaluating Solid Waste - Physical/Chemical Methods" and as outlined in the approved SACP. An ATEC field geologist screened the soils during excavation activities with a photoionization device which records total photoionizable vapors (TPVs) in parts per million (ppm). The excavation continued until no recordable TPVs were present in the soils. The lateral and vertical extent of the excavation pit is illustrated in Figure 3.

Upon completion of the excavation activities and stockpiling of soils, soil samples were collected inside the excavation pit at 0.5 ft intervals to a depth of 1.0 ft. The sample locations are illustrated in Figure 3. Background soil samples were obtained from grassy areas located near the parking lot to determine total cadmium concentrations in native soils. Soil samples were collected from four locations at 0.5 ft intervals to 2.0 ft and at 1.0 ft intervals from 2.0 to 3.0 ft. These native soil samples were utilized to compare total cadmium concentrations of soil samples collected within the excavation pit.

Each soil sample (with the exception of the background soil samples) was analyzed for volatile organic priority



EXCAVATION DEPTHS &
SAMPLING LOCATIONS
CMW - DRUM STORAGE AREA
INDIANAPOLIS, IN

PROJECT NO.
21-97312

SCALE
1" = 25'

FIGURE NO.
3

ATEC

pollutants (VOCs) and total cadmium in accordance with U.S. EPA Method 624 and SW-846 Method 6010, respectively. Soil samples with the identification letter "A" depicts samples collected from 0.0 to 0.5 ft depth while those soil samples with the letter "B" depicts samples collected from 0.5 to 1.0 ft depths. Soil samples with identification letters E and W indicate samples were collected from the east and west wall of the excavation pit, respectively. The laboratory analytical results of soil samples indicating parameters above the quantitation limits are presented in Table 1 and 2. The complete laboratory analytical report is presented in Appendix B.

Table 1
Laboratory Analytical Results of
Total Cadmium Concentrations in Soil Samples
(Parameters above Detection Limits Listed Only)

Soil Sample Locations	Total Cadmium Concentrations (mg/kg)*
EX-1.5A	2.2
EX-2A	5.5
EX-2.5A	2.9
EX-Center AE	1.7
EX-Center BW	2.5
Wall-2E	3.1

Background Soil Sample Locations	Total Cadmium Concentrations (mg/kg)
1A	1.7
3E	1.7
4A	12
4B	2.1
4C	3.4
4D	1.1

Table 2
Laboratory Analytical Results of VOCs
in Soil Samples
(Locations with Parameters above Detection
Limits Listed Only)

Soil Sample Locations	Major VOC Parameters, ppb* MeCL2	Acetone	1,1-DCA	1,1,1-TCA	TCE	Benzene	4M2P
EX-1A	21	-	150	-	-	-	-
EX-1B	87	-	210	-	-	-	-
EX-1.5A	-	-	-	-	-	-	-
EX-1.5B	-	-	55	53	-	-	-
EX-2A	27	-	-	-	-	-	-
EX-2B	15	-	-	15	-	-	-
EX-2.5A	-	-	15	-	-	-	-
EX-2.5B	-	-	-	12	-	-	-
EX-3A	20	-	-	-	-	-	-
EX-3B	-	-	220	-	-	310	-
EX-4A	9	42	-	6	6	-	-
EX-4B	-	-	16	50	22	-	-
EX-Center AE	-	-	12	-	-	-	-
EX-Center BW	11	-	-	-	-	-	-
Wall-2E	5	27	36	1400	540	-	-
Wall-2W	-	-	21	450	140	-	-
Wall-3E	-	160	230	340	95	-	-
Wall-3W	-	32	17	-	-	58	-

*ppb	parts per billion
MeCL2	Methylene Chloride
1,1-DCA	1,1-Dichloroethane
1,1,1-TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
4M2P	4-Methyl-2-Pentanone
-	less than quantitation limit

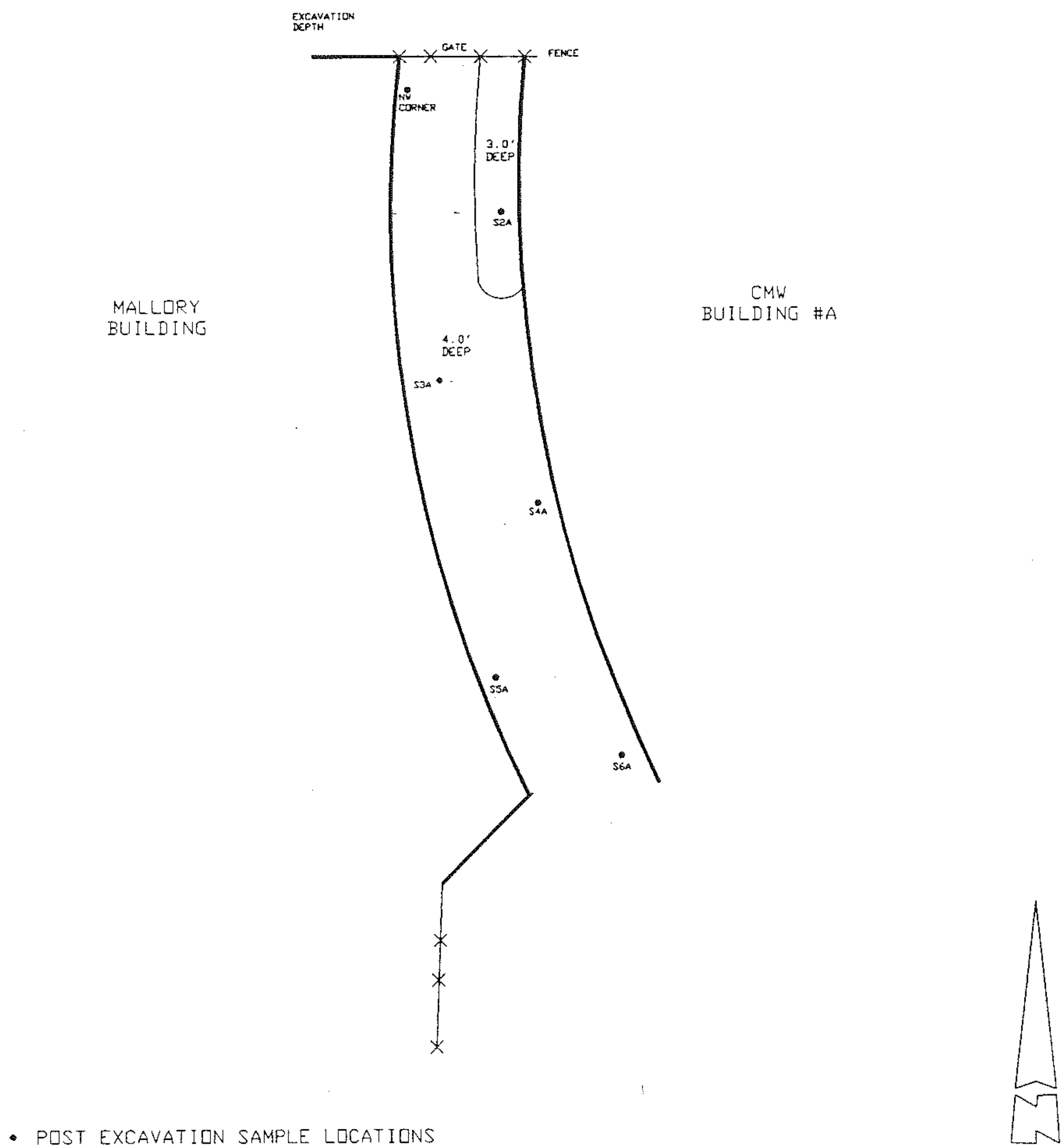
As indicated in Table 1, total cadmium concentrations from samples collected in the pit excavation are within three times (3X) the average total cadmium concentrations found in background samples. Therefore, the excavation of additional soils for the removal of cadmium is not warranted.

A review of laboratory analytical results indicate VOCs are present slightly above the quantitation limit in most areas, and in greater concentrations from samples collected below the concrete slab. Due to these elevated concentrations of VOCs, ATEC recommended the removal of the concrete slabs on both sides of the excavation pit and the removal of underlying soils.

3.0 CONTINUED ACTIVITIES

On September 6, 1989, ATEC removed the concrete slabs on both sides of the building. Subsequent to the removal of the slabs, soils were removed and stockpiled on double-lined plastic sheeting. An additional 1.0 ft thick layer of soil was also removed from the previously excavated pit at this time. The soil removal continued to the top of the building footer on both sides of the excavation. At this point, ATEC discontinued the excavation activities due to the potential for structural failure if excavation continued.

Subsequent to these activities, ATEC collected six (6) soil samples throughout the excavation at 0.0 to 0.5 ft and 0.5 to 1.0 ft depth intervals (Figure 4). The 0.0 to 0.5 ft interval samples were submitted to the ATEC Analytical Laboratory and analyzed for VOCs. The analytical results are presented in Table 3.



SUBSEQUENT EXCAVATION DEPTHS &
SAMPLING LOCATIONS
CMW - DRUM STORAGE AREA
INDIANAPOLIS, IN

PROJECT NO.
21-97312

SCALE
1" = 25'

FIGURE NO.
4

ATEC

Table 3
Laboratory Analytical Results of Soil Samples
Collected after Second Excavation
0.0 to 0.5 depth interval
VOC Parameters, ppb*

Sample Location	CE	MeCL2	1,1-DCE	1,1-DCA	1,1,1-TCA	TCE	TetraCE
NW Corner	120	160	-	54	-	-	-
S2A	-	-	-	12	38	21	-
S3A	-	7	13	44	190	36	-
S4A	-	16	-	-	7	6	-
S5A	-	15	-	12	77	34	-
S6A	-	12	-	-	98	100	7

CE	Chloroethane
MeCL2	Methylene Chloride
1,1-DCE	1,1-Dichloroethene
1,1-DCA	1,1-Dichloroethane
1,1,1-TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TetraCE	Tetrachloroethene

A review of Table 3 indicates VOCs (particularly 1,1,1-TCA and TCE) are present in the 0.0 to 0.5 ft depth interval. Due to the presence of VOCs in this uppermost sample interval, ATEC did not continue the VOC analysis of the 0.5 to 1.0 ft samples.

It is apparent that additional soil excavation at the project site may hinder the structural integrity of the buildings located on either side. Therefore, in lieu of additional soil removal, ATEC has outlined the following modified closure plan for the drum storage area.

July 19, 1989

Mr. Mark James
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: Twenty Soil/One Water VOA, Cadmium
Three Soil TCLP-VOA
U.S. EPA Method 624
SW 846 Method 8240, 6010
CMW, Inc.
ATEC Project Number 21-97312

Dear Mr. James:

Enclosed are the results of the Chemical Analyses for the one water and twenty-three soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on June 22, 1989, on behalf of CMW, Inc. The volatile samples were analyzed on Finnigan Incos 50 and 1020 OWA GC/MS/DS systems, complete with Superincos Software, via SW 846 Method 8240 for Purgeable Organic Compounds in soil and U.S. EPA Method 624 for Purgeable Organics in water. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard. Cadmium was analyzed on a Thermo Jarrell Ash ICAP-61 according to SW 846 Method 6010.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: July 10, 1989

Client: CMW
70 South Gray Street
P.O. Box 2266
Indianapolis, IN 46201

Sample Identification:	Drum Storage Area All Samples Analyzed by SW 846 Analytical Method Number 6010, with a 1 mg/kg Detection Limit.
Sample Taken By:	ATEC (MT)
Sample Matrix:	Soil
Date Sampled:	June 20 and 21, 1989
Date Received:	June 22, 1989
Analyst:	AJB, KEB, WBC
Verified By:	JDD
Processed By:	SAS
ATEC Lab Number:	890967

Sample I.D.	Cadmium Result (mg/kg)	Sample I.D.	Cadmium Result (mg/kg)
EX-1A	<1.0	EX-4A	<1.0
EX-1B	<1.0	EX-4B	<1.0
EX-1.5A	2.2	EX-Center AE	1.7
EX-1.5B	<1.0	EX-Center AW	<1.0
EX-2A	5.5	EX-Center BE	<1.0
EX-2B	<1.0	EX-Center BW	2.5
EX-2.5A	2.9	Wall-2E	3.1
EX-2.5B	<1.0	Wall-2W	<1.0
EX-3A	<1.0	Wall-3E	<1.0
EX-3B	<1.0	Wall-3W	<1.0
		Rinsate	0.016 (mg/L)

Respectfully submitted,
ATEC Associates, Inc.

John P. Pwenger

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-1A
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967A

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<40	40
Bromomethane	74-83-9	<40	40
Vinyl Chloride	75-01-4	<40*	40
Chloroethane	75-00-3	<40*	40
Methylene Chloride	75-09-2	21	20
Acetone	67-64-1	<40*	40
Carbon Disulfide	75-15-0	<20	20
1,1-Dichloroethene	75-35-4	<20*	20
1,1-Dichloroethane	75-35-3	150	20
Trans-1,2-Dichloroethene	156-60-5	<20*	20
Chloroform	67-66-3	<20	20
1,2-Dichloroethane	107-06-2	<20	20
2-Butanone	78-93-3	<40*	40
1,1,1-Trichloroethane	71-55-6	<20	20
Carbon Tetrachloride	56-23-5	<20	20
Vinyl Acetate	108-05-4	<40	40
Bromodichloromethane	75-27-4	<20	20
1,2-Dichloropropane	78-87-5	<20	20

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967A

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<20	20
Trichloroethene	79-01-6	<20*	20
Dibromochloromethane	124-48-1	<20	20
1,1,2-Trichloroethane	79-00-5	<20	20
Benzene	71-43-2	<20	20
cis-1,3-Dichloropropene	10061-01-5	<20	20
2-Chloroethylvinylether	110-75-8	<40	40
Bromoform	75-25-2	<20	20
4-Methyl-2-Pentanone	108-10-1	<40	40
2-Hexanone	591-78-6	<40*	40
Tetrachloroethene	127-18-4	<20	20
1,1,2,2-Tetrachloroethane	79-34-5	<20	20
Toluene	108-88-3	<20*	20
Chlorobenzene	108-90-7	<20	20
Ethylbenzene	100-41-4	<20	20
Styrene	100-42-5	<20	20
Total Xylenes		<20	20

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-1B
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967B

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<51	51
Bromomethane	74-83-9	<51	51
Vinyl Chloride	75-01-4	<51*	51
Chloroethane	75-00-3	<51*	51
Methylene Chloride	75-09-2	87	5
Acetone	67-64-1	<51*	51
Carbon Disulfide	75-15-0	<25	25
1,1-Dichloroethene	75-35-4	<25*	25
1,1-Dichloroethane	75-35-3	210	25
Trans-1,2-Dichloroethene	156-60-5	<25*	25
Chloroform	67-66-3	<25	25
1,2-Dichloroethane	107-06-2	<25	25
2-Butanone	78-93-3	<51*	51
1,1,1-Trichloroethane	71-55-6	<25	25
Carbon Tetrachloride	56-23-5	<25	25
Vinyl Acetate	108-05-4	<51	51
Bromodichloromethane	75-27-4	<25	25
1,2-Dichloropropane	78-87-5	<25	25

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967B

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<25	25
Trichloroethene	79-01-6	<25*	25
Dibromochloromethane	124-48-1	<25	25
1,1,2-Trichloroethane	79-00-5	<25	25
Benzene	71-43-2	<25*	25
cis-1,3-Dichloropropene	10061-01-5	<25	25
2-Chloroethylvinylether	110-75-8	<51	51
Bromoform	75-25-2	<25	25
4-Methyl-2-Pentanone	108-10-1	<51	51
2-Hexanone	591-78-6	<51*	51
Tetrachloroethene	127-18-4	<25	25
1,1,2,2-Tetrachloroethane	79-34-5	<25	25
Toluene	108-88-3	<25*	25
Chlorobenzene	108-90-7	<25	25
Ethylbenzene	100-41-4	<25	25
Styrene	100-42-5	<25	25
Total Xylenes		<25	25

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-1.5A
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967C

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<25	25
Bromomethane	74-83-9	<25	25
Vinyl Chloride	75-01-4	<25	25
Chloroethane	75-00-3	<25	25
Methylene Chloride	75-09-2	<13*	13
Acetone	67-64-1	<25*	25
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	<13*	13
Trans-1,2-Dichloroethene	156-60-5	<13	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<25*	25
1,1,1-Trichloroethane	71-55-6	<13*	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<25	25
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967C

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13*	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	<13	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<25	25
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<25	25
2-Hexanone	591-78-6	<25*	25
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	<13	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-1.5B
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967D

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<25	25
Bromomethane	74-83-9	<25	25
Vinyl Chloride	75-01-4	<25	25
Chloroethane	75-00-3	<25	25
Methylene Chloride	75-09-2	<13*	13
Acetone	67-64-1	<25*	25
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	55	13
Trans-1,2-Dichloroethene	156-60-5	<13	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<25*	25
1,1,1-Trichloroethane	71-55-6	53	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<25	25
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967D

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	<13	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<25	25
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<25	25
2-Hexanone	591-78-6	<25	25
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	<13	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Klein

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-2A
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967E

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<27	27
Bromomethane	74-83-9	<27	27
Vinyl Chloride	75-01-4	<27	27
Chloroethane	75-00-3	<27	27
Methylene Chloride	75-09-2	27	13
Acetone	67-64-1	<27*	27
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	<13	13
Trans-1,2-Dichloroethene	156-60-5	<13*	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<27*	27
1,1,1-Trichloroethane	71-55-6	<13*	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<27	27
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967E

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13*	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	<13	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<27	27
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<27	27
2-Hexanone	591-78-6	<27*	27
Tetrachloroethene	127-18-4	<13*	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	<13	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-2B
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967F

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<28	28
Bromomethane	74-83-9	<28	28
Vinyl Chloride	75-01-4	<28	28
Chloroethane	75-00-3	<28	28
Methylene Chloride	75-09-2	15	14
Acetone	67-64-1	<28	28
Carbon Disulfide	75-15-0	<14	14
1,1-Dichloroethene	75-35-4	<14	14
1,1-Dichloroethane	75-35-3	<14*	14
Trans-1,2-Dichloroethene	156-60-5	<14*	14
Chloroform	67-66-3	<14	14
1,2-Dichloroethane	107-06-2	<14	14
2-Butanone	78-93-3	<28*	28
1,1,1-Trichloroethane	71-55-6	15	14
Carbon Tetrachloride	56-23-5	<14	14
Vinyl Acetate	108-05-4	<28	28
Bromodichloromethane	75-27-4	<14	14
1,2-Dichloropropane	78-87-5	<14	14

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967F

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<14	14
Trichloroethene	79-01-6	<14*	14
Dibromochloromethane	124-48-1	<14	14
1,1,2-Trichloroethane	79-00-5	<14	14
Benzene	71-43-2	<14	14
cis-1,3-Dichloropropene	10061-01-5	<14	14
2-Chloroethylvinylether	110-75-8	<28	28
Bromoform	75-25-2	<14	14
4-Methyl-2-Pentanone	108-10-1	<28	28
2-Hexanone	591-78-6	<28*	28
Tetrachloroethene	127-18-4	<14	14
1,1,2,2-Tetrachloroethane	79-34-5	<14	14
Toluene	108-88-3	<14	14
Chlorobenzene	108-90-7	<14	14
Ethylbenzene	100-41-4	<14	14
Styrene	100-42-5	<14	14
Total Xylenes		<14	14

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-2.5A
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967G

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<24	24
Bromomethane	74-83-9	<24	24
Vinyl Chloride	75-01-4	<24	24
Chloroethane	75-00-3	<24	24
Methylene Chloride	75-09-2	<12*	12
Acetone	67-64-1	<24*	24
Carbon Disulfide	75-15-0	<12	12
1,1-Dichloroethene	75-35-4	<12	12
1,1-Dichloroethane	75-35-3	<12*	12
Trans-1,2-Dichloroethene	156-60-5	<12	12
Chloroform	67-66-3	<12	12
1,2-Dichloroethane	107-06-2	<12	12
2-Butanone	78-93-3	<24*	24
1,1,1-Trichloroethane	71-55-6	15	12
Carbon Tetrachloride	56-23-5	<12	12
Vinyl Acetate	108-05-4	<24	24
Bromodichloromethane	75-27-4	<12	12
1,2-Dichloropropane	78-87-5	<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967G

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<12	12
Trichloroethene	79-01-6	<12*	12
Dibromochloromethane	124-48-1	<12	12
1,1,2-Trichloroethane	79-00-5	<12	12
Benzene	71-43-2	<12	12
cis-1,3-Dichloropropene	10061-01-5	<12	12
2-Chloroethylvinylether	110-75-8	<24	24
Bromoform	75-25-2	<12	12
4-Methyl-2-Pentanone	108-10-1	<24	24
2-Hexanone	591-78-6	<24	24
Tetrachloroethene	127-18-4	<12	12
1,1,2,2-Tetrachloroethane	79-34-5	<12	12
Toluene	108-88-3	<12	12
Chlorobenzene	108-90-7	<12	12
Ethylbenzene	100-41-4	<12	12
Styrene	100-42-5	<12	12
Total Xylenes		<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-2.5B
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967H

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<24	24
Bromomethane	74-83-9	<24	24
Vinyl Chloride	75-01-4	<24	24
Chloroethane	75-00-3	<24	24
Methylene Chloride	75-09-2	<12*	12
Acetone	67-64-1	<24*	24
Carbon Disulfide	75-15-0	<12	12
1,1-Dichloroethene	75-35-4	<12	12
1,1-Dichloroethane	75-35-3	<12*	12
Trans-1,2-Dichloroethene	156-60-5	<12	12
Chloroform	67-66-3	<12	12
1,2-Dichloroethane	107-06-2	<12	12
2-Butanone	78-93-3	<24	24
1,1,1-Trichloroethane	71-55-6	12	12
Carbon Tetrachloride	56-23-5	<12	12
Vinyl Acetate	108-05-4	<24	24
Bromodichloromethane	75-27-4	<12	12
1,2-Dichloropropane	78-87-5	<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967H

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<12	12
Trichloroethene	79-01-6	<12*	12
Dibromochloromethane	124-48-1	<12	12
1,1,2-Trichloroethane	79-00-5	<12	12
Benzene	71-43-2	<12	12
cis-1,3-Dichloropropene	10061-01-5	<12	12
2-Chloroethylvinylether	110-75-8	<24	24
Bromoform	75-25-2	<12	12
4-Methyl-2-Pentanone	108-10-1	<24	24
2-Hexanone	591-78-6	<24	24
Tetrachloroethene	127-18-4	<12	12
1,1,2,2-Tetrachloroethane	79-34-5	<12	12
Toluene	108-88-3	<12	12
Chlorobenzene	108-90-7	<12	12
Ethylbenzene	100-41-4	<12	12
Styrene	100-42-5	<12	12
Total Xylenes		<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Klein

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-3A
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967I

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<26	26
Bromomethane	74-83-9	<26	26
Vinyl Chloride	75-01-4	<26	26
Chloroethane	75-00-3	<26	26
Methylene Chloride	75-09-2	20	13
Acetone	67-64-1	27	26
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	<13*	13
Trans-1,2-Dichloroethene	156-60-5	<13	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<26*	26
1,1,1-Trichloroethane	71-55-6	<13*	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<26	26
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967I

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	<13	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<26	26
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<26	26
2-Hexanone	591-78-6	<26	26
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	<13*	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-3B
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967J

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<23	23
Bromomethane	74-83-9	<23	23
Vinyl Chloride	75-01-4	<23*	23
Chloroethane	75-00-3	<23*	23
Methylene Chloride	75-09-2	<12*	12
Acetone	67-64-1	<23*	23
Carbon Disulfide	75-15-0	<12	12
1,1-Dichloroethene	75-35-4	<12*	12
1,1-Dichloroethane	75-35-3	220	12
Trans-1,2-Dichloroethene	156-60-5	<12*	12
Chloroform	67-66-3	<12	12
1,2-Dichloroethane	107-06-2	<12	12
2-Butanone	78-93-3	<23*	23
1,1,1-Trichloroethane	71-55-6	<12*	12
Carbon Tetrachloride	56-23-5	<12	12
Vinyl Acetate	108-05-4	<23	23
Bromodichloromethane	75-27-4	<12	12
1,2-Dichloropropane	78-87-5	<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967J

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<12	12
Trichloroethene	79-01-6	<12*	12
Dibromochloromethane	124-48-1	<12	12
1,1,2-Trichloroethane	79-00-5	<12	12
Benzene	71-43-2	310	12
cis-1,3-Dichloropropene	10061-01-5	<12	12
2-Chloroethylvinylether	110-75-8	<23	23
Bromoform	75-25-2	<12	12
4-Methyl-2-Pentanone	108-10-1	<23	23
2-Hexanone	591-78-6	<23	23
Tetrachloroethene	127-18-4	<12	12
1,1,2,2-Tetrachloroethane	79-34-5	<12	12
Toluene	108-88-3	<12*	12
Chlorobenzene	108-90-7	<12	12
Ethylbenzene	100-41-4	<12	12
Styrene	100-42-5	<12	12
Total Xylenes		<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-4A
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967K 1 of 2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	9	5
Acetone	67-64-1	42	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5*	5
Trans-1,2-Dichloroethene	156-60-5	< 5*	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	6	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967K

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	6	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5*	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5*	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-4B
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967L

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<23	23
Bromomethane	74-83-9	<23	23
Vinyl Chloride	75-01-4	<23	23
Chloroethane	75-00-3	<23	23
Methylene Chloride	75-09-2	<11*	11
Acetone	67-64-1	<23*	23
Carbon Disulfide	75-15-0	<11	11
1,1-Dichloroethene	75-35-4	<11*	11
1,1-Dichloroethane	75-35-3	16	11
Trans-1,2-Dichloroethene	156-60-5	18	11
Chloroform	67-66-3	<11*	11
1,2-Dichloroethane	107-06-2	<11	11
2-Butanone	78-93-3	<23*	23
1,1,1-Trichloroethane	71-55-6	50	11
Carbon Tetrachloride	56-23-5	<11	11
Vinyl Acetate	108-05-4	<23	23
Bromodichloromethane	75-27-4	<11	11
1,2-Dichloropropane	78-87-5	<11	11

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967L

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<11	11
Trichloroethene	79-01-6	22	11
Dibromochloromethane	124-48-1	<11	11
1,1,2-Trichloroethane	79-00-5	<11	11
Benzene	71-43-2	<11*	11
cis-1,3-Dichloropropene	10061-01-5	<11	11
2-Chloroethylvinylether	110-75-8	<23	23
Bromoform	75-25-2	<11	11
4-Methyl-2-Pentanone	108-10-1	<23	23
2-Hexanone	591-78-6	<23	23
Tetrachloroethene	127-18-4	<11*	11
1,1,2,2-Tetrachloroethane	79-34-5	<11	11
Toluene	108-88-3	<11	11
Chlorobenzene	108-90-7	<11	11
Ethylbenzene	100-41-4	<11	11
Styrene	100-42-5	<11	11
Total Xylenes		<11	11

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-Center-AE
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967M

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<23	23
Bromomethane	74-83-9	<23	23
Vinyl Chloride	75-01-4	<23	23
Chloroethane	75-00-3	<23	23
Methylene Chloride	75-09-2	<12*	12
Acetone	67-64-1	<23*	23
Carbon Disulfide	75-15-0	<12*	12
1,1-Dichloroethene	75-35-4	<12*	12
1,1-Dichloroethane	75-35-3	12	12
Trans-1,2-Dichloroethene	156-60-5	<12	12
Chloroform	67-66-3	<12	12
1,2-Dichloroethane	107-06-2	<12	12
2-Butanone	78-93-3	<23*	23
1,1,1-Trichloroethane	71-55-6	<12*	12
Carbon Tetrachloride	56-23-5	<12	12
Vinyl Acetate	108-05-4	<23	23
Bromodichloromethane	75-27-4	<12	12
1,2-Dichloropropane	78-87-5	<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967M

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<12	12
Trichloroethene	79-01-6	<12*	12
Dibromochloromethane	124-48-1	<12	12
1,1,2-Trichloroethane	79-00-5	<12	12
Benzene	71-43-2	<12	12
cis-1,3-Dichloropropene	10061-01-5	<12	12
2-Chloroethylvinylether	110-75-8	<23	23
Bromoform	75-25-2	<12	12
4-Methyl-2-Pentanone	108-10-1	<23	23
2-Hexanone	591-78-6	<23	23
Tetrachloroethene	127-18-4	<12	12
1,1,2,2-Tetrachloroethane	79-34-5	<12	12
Toluene	108-88-3	<12	12
Chlorobenzene	108-90-7	<12	12
Ethylbenzene	100-41-4	<12	12
Styrene	100-42-5	<12	12
Total Xylenes		<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-Center-AW
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967N

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<25	25
Bromomethane	74-83-9	<25	25
Vinyl Chloride	75-01-4	<25	25
Chloroethane	75-00-3	<25	25
Methylene Chloride	75-09-2	<13*	13
Acetone	67-64-1	<25*	25
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	<13	13
Trans-1,2-Dichloroethene	156-60-5	<13	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<25*	25
1,1,1-Trichloroethane	71-55-6	<13	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<25	25
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967N

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	<13	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<25	25
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<25	25
2-Hexanone	591-78-6	<25*	25
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	<13	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-Center-BE
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967P

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<24	24
Bromomethane	74-83-9	<24	24
Vinyl Chloride	75-01-4	<24	24
Chloroethane	75-00-3	<24	24
Methylene Chloride	75-09-2	<12*	12
Acetone	67-64-1	<24*	24
Carbon Disulfide	75-15-0	<12	12
1,1-Dichloroethene	75-35-4	<12	12
1,1-Dichloroethane	75-35-3	<12	12
Trans-1,2-Dichloroethene	156-60-5	<12	12
Chloroform	67-66-3	<12	12
1,2-Dichloroethane	107-06-2	<12	12
2-Butanone	78-93-3	<24*	24
1,1,1-Trichloroethane	71-55-6	<12	12
Carbon Tetrachloride	56-23-5	<12	12
Vinyl Acetate	108-05-4	<24	24
Bromodichloromethane	75-27-4	<12	12
1,2-Dichloropropane	78-87-5	<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967P

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<12	12
Trichloroethene	79-01-6	<12	12
Dibromochloromethane	124-48-1	<12	12
1,1,2-Trichloroethane	79-00-5	<12	12
Benzene	71-43-2	<12	12
cis-1,3-Dichloropropene	10061-01-5	<12	12
2-Chloroethylvinylether	110-75-8	<24	24
Bromoform	75-25-2	<12	12
4-Methyl-2-Pentanone	108-10-1	<24	24
2-Hexanone	591-78-6	<24	24
Tetrachloroethene	127-18-4	<12	12
1,1,2,2-Tetrachloroethane	79-34-5	<12	12
Toluene	108-88-3	<12	12
Chlorobenzene	108-90-7	<12	12
Ethylbenzene	100-41-4	<12	12
Styrene	100-42-5	<12	12
Total Xylenes		<12	12

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-Center-~~3W~~ BW
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: July 6, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967Q

1 of 2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<19	19
Bromomethane	74-83-9	<19	19
Vinyl Chloride	75-01-4	<19	19
Chloroethane	75-00-3	<19	19
Methylene Chloride	75-09-2	11	10
Acetone	67-64-1	<19	19
Carbon Disulfide	75-15-0	<10	10
1,1-Dichloroethene	75-35-4	<10	10
1,1-Dichloroethane	75-35-3	<10	10
Trans-1,2-Dichloroethene	156-60-5	<10	10
Chloroform	67-66-3	<10	10
1,2-Dichloroethane	107-06-2	<10	10
2-Butanone	78-93-3	12	19
1,1,1-Trichloroethane	71-55-6	<10	10
Carbon Tetrachloride	56-23-5	<10	10
Vinyl Acetate	108-05-4	<19	19
Bromodichloromethane	75-27-4	<10	10
1,2-Dichloropropane	78-87-5	<10	10

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967Q

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<10	10
Trichloroethene	79-01-6	<10	10
Dibromochloromethane	124-48-1	<10	10
1,1,2-Trichloroethane	79-00-5	<10	10
Benzene	71-43-2	<10	10
cis-1,3-Dichloropropene	10061-01-5	<10	10
2-Chloroethylvinylether	110-75-8	<19	19
Bromoform	75-25-2	<10	10
4-Methyl-2-Pentanone	108-10-1	<19	19
2-Hexanone	591-78-6	<19	19
Tetrachloroethene	127-18-4	<10	10
1,1,2,2-Tetrachloroethane	79-34-5	<10	10
Toluene	108-88-3	<10	10
Chlorobenzene	108-90-7	<10	10
Ethylbenzene	100-41-4	<10	10
Styrene	100-42-5	<10	10
Total Xylenes		<10	10

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Wall-2E
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967R

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	5	5
Acetone	67-64-1	27	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	20	5
1,1-Dichloroethane	75-35-3	36	5
Trans-1,2-Dichloroethene	156-60-5	36	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	1,400	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967R

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	540	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Wall-2W
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967S

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<22	22
Bromomethane	74-83-9	<22	22
Vinyl Chloride	75-01-4	<22	22
Chloroethane	75-00-3	<22	22
Methylene Chloride	75-09-2	<11*	11
Acetone	67-64-1	<22*	22
Carbon Disulfide	75-15-0	<11	11
1,1-Dichloroethene	75-35-4	<11*	11
1,1-Dichloroethane	75-35-3	21	11
Trans-1,2-Dichloroethene	156-60-5	13	11
Chloroform	67-66-3	<11	11
1,2-Dichloroethane	107-06-2	<11	11
2-Butanone	78-93-3	<22*	22
1,1,1-Trichloroethane	71-55-6	450	11
Carbon Tetrachloride	56-23-5	<11	11
Vinyl Acetate	108-05-4	<22	22
Bromodichloromethane	75-27-4	<11	11
1,2-Dichloropropane	78-87-5	<11	11

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967S

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<11	11
Trichloroethene	79-01-6	140	11
Dibromochloromethane	124-48-1	<11	11
1,1,2-Trichloroethane	79-00-5	<11	11
Benzene	71-43-2	<11	11
cis-1,3-Dichloropropene	10061-01-5	<11	11
2-Chloroethylvinylether	110-75-8	<22	22
Bromoform	75-25-2	<11	11
4-Methyl-2-Pentanone	108-10-1	<22	22
2-Hexanone	591-78-6	<22*	22
Tetrachloroethene	127-18-4	<11	11
1,1,2,2-Tetrachloroethane	79-34-5	<11	11
Toluene	108-88-3	<11	11
Chlorobenzene	108-90-7	<11	11
Ethylbenzene	100-41-4	<11	11
Styrene	100-42-5	<11	11
Total Xylenes		<11	11

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Stock Pile F/C
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967W 1 of 2

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	20	5
Acetone	67-64-1	23	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	22	5
1,1-Dichloroethane	75-35-3	38	5
Trans-1,2-Dichloroethene	156-60-5	12	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	620	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967W

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	57	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	16	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	11	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	100	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	140	5
Styrene	100-42-5	< 5	5
Total Xylenes		1,200	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Rigdon, B. Keller
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Stock Pile E
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: July 5, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967X

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	7	5
Acetone	67-64-1	42	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	7	5
1,1-Dichloroethane	75-35-3	19	5
Trans-1,2-Dichloroethene	156-60-5	45	5
Chloroform	67-66-3	23	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	180	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967X

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	430	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	9	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	15	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	24	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	17	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	12	5
Styrene	100-42-5	< 5	5
Total Xylenes		88	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Stock Pile W
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 30, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967Y

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	21	5
Acetone	67-64-1	64	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	6	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	38	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967Y

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	45	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	13	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5*	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	5	5
Styrene	100-42-5	< 5	5
Total Xylenes		28	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME	CLIENT	LAB PROJ. NO.
21-97312	Drum Storage Area	CMW	890967

SAMPLERS: *(Signature)* Maureen Turman

SAMPLING METHOD: hand auger

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY	Total Cd		SAMPLE LOCATION / REMARKS
Ex-1A	6/20			/		/	✓			/		2	-1	/							/		
Ex-1B	6/20			/		/	✓			/		2	-2	/							/		
Ex-center AE	6/21			/		/	✓			/		~~2~~ 1 MT	-13	/							/		
Ex-center BE	6/21			/		/	✓			/		~~2~~ 1 MT	-16	/							/		
Ex-center AW	6/21			/		/	✓			/		~~2~~ 1 MT	-14	/							/		
Ex-center BW	6/21			/		/	✓			/		~~2~~ 1 MT	-17	/							/		
Ex-4A	6/20			/		/	✓			/		3	-11	/							/		
Ex-4B	6/20			/		/	✓			/		3	-12	/							/		
* Wall-~~4~~2 E MT	6/20			/		/	✓			/		2	-18	/							/		
* Wall-~~4~~2 W	6/20			/		/	✓			/		2	-19	/							/		
Wall-3E	6/20			/		/	✓			/		2	-20	/							/		
Wall-3W	6/20			/		/	✓			/		2	-21	/							/		
Ex-1.5A	6/21			/		/	✓			/		1	-3	/							/		
Ex-1.5B	6/21			/		/	✓			/		1	-4	/							/		
Ex-2A	6/20			/		/	✓			/		2	-5	/							/		
Ex-2B	6/20			/		/	✓			/		2	-6	/							/		

ATEC Environmental Services
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Project Manager / Phone #:
Maureen Turman	6/22/89 9:45 am	Russel Barga	6-22-89 9:45 am	

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME	CLIENT	LAB PROJ. NO.
CJ-97312	Drum Storage Area	CMW	890967

SAMPLERS: *(Signature)* Maureen Turner

SAMPLING METHOD: hand auger

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY	Total Cd	TCLP	SAMPLE LOCATION / REMARKS
Ex-2.5A	6/21			/		/	/			/		1	-7	/							/		
Ex-2.5B	"			/		/	/			/		1	-8	/							/		
Ex-3A	6/20			/		/	/			/		3	-9	/							/		
Ex-3B	6/20			/		/				/		3	-10	/							/		
Rinsate	"		/		/					/		2	-22	/							/		
Stockpile E	6/21			/		/				/		3 Drm	-24									/	
Stockpile C	6/21			/		/				/		1	-23									/	
Stockpile W	6/21			/		/				/		1	-25									/	

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Project Manager / Phone #:
Maureen Turner	6/22/89 9:15 am	David Borys	6-22-89 9:15 am	

ATEC Environmental Services
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: EX-Center-AW, Duplicate
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967NDUP

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<23	23
Bromomethane	74-83-9	<23	23
Vinyl Chloride	75-01-4	<23	23
Chloroethane	75-00-3	<23	23
Methylene Chloride	75-09-2	<11*	11
Acetone	67-64-1	75	23
Carbon Disulfide	75-15-0	<11	11
1,1-Dichloroethene	75-35-4	<11	11
1,1-Dichloroethane	75-35-3	<11	11
Trans-1,2-Dichloroethene	156-60-5	<11	11
Chloroform	67-66-3	<11	11
1,2-Dichloroethane	107-06-2	<11	11
2-Butanone	78-93-3	<23*	23
1,1,1-Trichloroethane	71-55-6	<11	11
Carbon Tetrachloride	56-23-5	<11	11
Vinyl Acetate	108-05-4	<23	23
Bromodichloromethane	75-27-4	<11	11
1,2-Dichloropropane	78-87-5	<11	11

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967NDUP

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<11	11
Trichloroethene	79-01-6	<11	11
Dibromochloromethane	124-48-1	<11	11
1,1,2-Trichloroethane	79-00-5	<11	11
Benzene	71-43-2	<11	11
cis-1,3-Dichloropropene	10061-01-5	<11	11
2-Chloroethylvinylether	110-75-8	<23	23
Bromoform	75-25-2	<11	11
4-Methyl-2-Pentanone	108-10-1	<23	23
2-Hexanone	591-78-6	<23	23
Tetrachloroethene	127-18-4	<11	11
1,1,2,2-Tetrachloroethane	79-34-5	<11	11
Toluene	108-88-3	<11	11
Chlorobenzene	108-90-7	<11	11
Ethylbenzene	100-41-4	<11	11
Styrene	100-42-5	<11	11
Total Xylenes		<11	11

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Wall-3W, Duplicate
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967UDUP

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<26	26
Bromomethane	74-83-9	<26	26
Vinyl Chloride	75-01-4	<26	26
Chloroethane	75-00-3	<26	26
Methylene Chloride	75-09-2	<13*	13
Acetone	67-64-1	36	26
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	<13*	13
Trans-1,2-Dichloroethene	156-60-5	<13	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<26*	26
1,1,1-Trichloroethane	71-55-6	<13	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<26	26
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967UDUP

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	19	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<26	26
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<26	26
2-Hexanone	591-78-6	<26	26
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	53	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Stock Pile ~~F~~ C, Duplicate
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967WDUP 1 of 2

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	23	5
Acetone	67-64-1	35	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	21	5
1,1-Dichloroethane	75-35-3	40	5
Trans-1,2-Dichloroethene	156-60-5	13	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	570	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967WDUP

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	57	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	17	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	10	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	100	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	140	5
Styrene	100-42-5	< 5	5
Total Xylenes		1,200	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: J. Rigdon, B. Keller
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Stock Pile W, Duplicate
Sample Matrix: Soil
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 30, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967YDUP

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	20	5
Acetone	67-64-1	69	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	29	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967YDUP

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	37	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	16	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5*	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5*	5
Styrene	100-42-5	< 5	5
Total Xylenes		25	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Method Blank
Sample Matrix: Soil
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK062889

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	42	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK062889

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10*	10
Tetrachloroethene	127-18-4	< 5*	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Method Blank
Sample Matrix: Soil
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK062989

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5*	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK062989

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10*	10
Tetrachloroethene	127-18-4	< 5*	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5*	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Method Blank
Sample Matrix: Water
Date Sample Analyzed: June 30, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK63089

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK63089

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Method Blank
Sample Matrix: Water
Date Sample Analyzed: July 5, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK70589

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5*	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK70589

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Method Blank
Sample Matrix: Soil
Date Sample Analyzed: July 6, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK070689

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	11	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK070689

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Method Blank - 1020 #1
Sample Matrix: Soil
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK062889 1 of 2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	9	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK062889

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Klein

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Method Blank - 1020 #1
Sample Matrix: Soil
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK062789

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5*	5
Acetone	67-64-1	27	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK062789

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: TCLP Headspace Blank
Sample Matrix: Soil
Date Sample Analyzed: June 29, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. TCLPBLK629

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	23	5
Acetone	67-64-1	32	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. TCLPBLK629

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: J. Rigdon, B. Keller
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: TCLP Blank
Sample Matrix: Water
Date Sample Analyzed: July 5, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967BLK

TCLP Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	6	5
Acetone	67-64-1	38	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967BLK

TCLP Analyte	CAS Number	Concentration (ug/L)	Quant Limit
Trans-1, 3-Dichloropropene	10061-02-6	< 5	
Trichloroethene	79-01-6	< 5	
Dibromochloromethane	124-48-1	< 5	
1,1,2-Trichloroethane	79-00-5	< 5	
Benzene	71-43-2	< 5	
cis-1,3-Dichloropropene	10061-01-5	< 5	
2-Chloroethylvinylether	110-75-8	<10	
Bromoform	75-25-2	< 5	
4-Methyl-2-Pentanone	108-10-1	12	
2-Hexanone	591-78-6	<10	
Tetrachloroethene	127-18-4	< 5	
1,1,2,2-Tetrachloroethane	79-34-5	< 5	
Toluene	108-88-3	< 5*	
Chlorobenzene	108-90-7	< 5	
Ethylbenzene	100-41-4	< 5	
Styrene	100-42-5	< 5	
Total Xylenes		< 5	

* Analyte detected but amount present is less than the Quant Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing

September 7, 1989

Mr. Mark James
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: One Soil VOA
SW 846 Method 8240
Same Day Rush
Verbals Reported September 6, 1989
(12:10 p.m.)
CMW, Inc.
ATEC Project Number 21-97312

Dear Mr. James:

Enclosed are the results of the Organic Analysis for the soil sample which was submitted to the ATEC Environmental/Analytical Testing Division on September 6, 1989, on behalf of CMW, Inc. The volatile sample was analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: ~~MW~~ NW-Corner
Sample Matrix: Soil
Date Sample Collected: September 5, 1989
Date Sample Received: September 6, 1989
Date Sample Analyzed: September 6, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 91610A2 1 of 2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<25	25
Bromomethane	74-83-9	<25	25
Vinyl Chloride	75-01-4	<25	25
Chloroethane	75-00-3	120	25
Methylene Chloride	75-09-2	160	13
Acetone	67-64-1	<25*	25
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	54	13
Trans-1,2-Dichloroethene	156-60-5	<13*	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<25*	25
1,1,1-Trichloroethane	71-55-6	<13*	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<25	25
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Wall-3E
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967T

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<50	50
Bromomethane	74-83-9	<50	50
Vinyl Chloride	75-01-4	<50	50
Chloroethane	75-00-3	<50	50
Methylene Chloride	75-09-2	<25*	25
Acetone	67-64-1	160	50
Carbon Disulfide	75-15-0	<25	25
1,1-Dichloroethene	75-35-4	<25*	25
1,1-Dichloroethane	75-35-3	230	25
Trans-1,2-Dichloroethene	156-60-5	82	25
Chloroform	67-66-3	<25	25
1,2-Dichloroethane	107-06-2	<25	25
2-Butanone	78-93-3	<50	50
1,1,1-Trichloroethane	71-55-6	340	25
Carbon Tetrachloride	56-23-5	<25	25
Vinyl Acetate	108-05-4	<50	50
Bromodichloromethane	75-27-4	<25	25
1,2-Dichloropropane	78-87-5	<25	25

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967T

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<25	25
Trichloroethene	79-01-6	95	25
Dibromochloromethane	124-48-1	<25	25
1,1,2-Trichloroethane	79-00-5	<25	25
Benzene	71-43-2	<25*	25
cis-1,3-Dichloropropene	10061-01-5	<25	25
2-Chloroethylvinylether	110-75-8	<50	50
Bromoform	75-25-2	<25	25
4-Methyl-2-Pentanone	108-10-1	<50	50
2-Hexanone	591-78-6	<50	50
Tetrachloroethene	127-18-4	<25	25
1,1,2,2-Tetrachloroethane	79-34-5	<25	25
Toluene	108-88-3	<25	25
Chlorobenzene	108-90-7	<25	25
Ethylbenzene	100-41-4	<25	25
Styrene	100-42-5	<25	25
Total Xylenes		<25	25

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Wall-3W
Sample Matrix: Soil
Date Sample Collected: June 20, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: June 28, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967U

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<26	26
Bromomethane	74-83-9	<26	26
Vinyl Chloride	75-01-4	<26	26
Chloroethane	75-00-3	<26	26
Methylene Chloride	75-09-2	<13*	13
Acetone	67-64-1	32	26
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1-Dichloroethane	75-35-3	17	13
Trans-1,2-Dichloroethene	156-60-5	<13	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<26*	26
1,1,1-Trichloroethane	71-55-6	<13	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<26	26
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967U

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	58	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<26	26
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<26	26
2-Hexanone	591-78-6	<26*	26
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	160	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: 70 S. Gray
P.O. Box 2266
Indianapolis, IN 46201

Client Sample Identification: Rinseate
Sample Matrix: Water
Date Sample Collected: June 21, 1989
Date Sample Received: June 22, 1989
Date Sample Analyzed: July 6, 1989
Processed By: FEB

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 90967V

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	14	5
Acetone	67-64-1	16	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	5	5
1,1-Dichloroethane	75-35-3	< 5*	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	11	10
1,1,1-Trichloroethane	71-55-6	< 5*	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 90967V

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5*	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5*	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: J. Sima
Date Reported: July 10, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

ANALYTICAL RESULTS

ATEC Lab No. 91610A2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13*	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	79-00-5	<13	13
Benzene	71-43-2	<13*	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<25	25
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	108-10-1	<25	25
2-Hexanone	591-78-6	<25	25
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	<13*	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13*	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: D. Luckenbill
Verified: K. Kline
Date Reported: September 6, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

CHAIN OF CUSTODY RECORD

PROJ. NO. 21-97312

PROJECT NAME CMW, INC. DRUM STORAGE CLOSU

CLIENT CMW, INC.

LAB PROJ. NO. 891610

SAMPLERS: *(Signature)* Mark R. James

SAMPLING METHOD GRAB / HAND AUGER

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY			SAMPLE LOCATION / REMARKS
NW CORNER 6.0'-6.5'	9-5-89	4:45p		X		X				X		1		X									

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Mark R. James	9-6-89 7:00 AM				

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Project Manager / Phone #:
		John Perrin	9/6 8:00	

ATEC Environmental Services

Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

October 30, 1989

Mr. Mark James
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: Six Soil/One Water VOA
Three CCWA Parameters
SW 846 Method 8240
U.S. EPA Method 624, 625
CMW, Inc.
ATEC Project Number 21-97312

Dear Mr. James:

Enclosed are the results of the Organic Analyses for the nine soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on September 25, 1989 on behalf of CMW, Inc. The volatile samples were analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 for Purgeable Organic Compounds in soil and U.S. EPA Method 624 for Purgeable Organics in water. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard. Semi-volatile analyses were performed on a Finnigan Incos 50 GC/MS/DS system via U.S. EPA Method 625 for Extractable Organic Compounds. Prior to analysis, this system was tuned against Decafluorotriphenylphosphine and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

KSK/sas

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: S2-A
Sample Matrix: Soil
Date Sample Collected: September 21, 1989
Date Sample Received: September 25, 1989
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 91756A

1 of 2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	12	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	38	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 91756A

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	21	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: S3-A
Sample Matrix: Soil
Date Sample Collected: September 21, 1989
Date Sample Received: September 25, 1989
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 91756C

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	7	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	12	5
1,1-Dichloroethane	75-35-3	44	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	290	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 91756C

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	35	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: S4-A
Sample Matrix: Soil
Date Sample Collected: September 21, 1989
Date Sample Received: September 25, 1989
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 91756E

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	16	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	7	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 91756E

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	6	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: S5-A
Sample Matrix: Soil
Date Sample Collected: September 21, 1989
Date Sample Received: September 25, 1989
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 91756G

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	15	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	11	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	75	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 91756G

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	33	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5*	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: S6-A
Sample Matrix: Soil
Date Sample Collected: September 21, 1989
Date Sample Received: September 25, 1989
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 91756I

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	12	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	96	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 91756I

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	99	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	7	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: S2-ADUP
Sample Matrix: Soil
Date Sample Collected: September 21, 1989
Date Sample Received: September 25, 1989
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 917560

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	6	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	9	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 917560

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	13	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: Trip Blank
Sample Matrix: Water
Date Sample Collected: September 21, 1989
Date Sample Received: September 25, 1989
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. 91756N

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	5	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	7	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 91756N

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: Method Blank
Sample Matrix: Soil
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK092689

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	6	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK092689

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: CMW, Inc.
Client Address: P.O. Box 2266
Indianapolis, IN 46801

Client Sample Identification: Method Blank
Sample Matrix: Water
Date Sample Analyzed: September 26, 1989

VOLATILE COMPOUNDS
ANALYTICAL RESULTS

ATEC Lab No. BLANK092689

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	6	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1-Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. BLANK092689

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	108-10-1	<10	10
2-Hexanone	591-78-6	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: B. Keller
Date Reported: October 5, 1989

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification: CCWE Analysis-TCLP
U.S. EPA Method 624, 625
Sample Taken By: ATEC (KR)
Sample Matrix: Water
Date Sampled: September 21, 1989
Date Received: September 25, 1989
Date Analyzed: October 3 and 4, 1989
Analyst: DAL, BLK
Verified By: KSK
ATEC Lab Number: 891756

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)	P-1	Quantitation Limit
Acetone	40	10
n-Butyl Alcohol	< 10	10
Carbon Disulfide	< 5	5
Carbon Tetrachloride	< 5	5
Chlorobenzene	< 5	5
Cresol	< 50	50
Cresylic Acid	< 50	50
Cyclohexanone	< 50	50
1,2-Dichlorobenzene	< 50	50
Ethyl acetate	< 100	100
Ethylbenzene	< 5	5
Ethyl ether	<1,000	1,000
Isobutanol	< 100	100

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification:	CCWE Analysis-TCLP U.S. EPA Method 624, 625
Sample Taken By:	ATEC (KR)
Sample Matrix:	Water
Date Sampled:	September 21, 1989
Date Received:	September 25, 1989
Date Analyzed:	October 3 and 4, 1989
Analyst:	DAL, BLK
Verified By:	KSK
ATEC Lab Number:	891756

Page 2 of 2

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)		P-1	Quantitation Limit
Methanol	<	500	500
Methylene Chloride		28	5
Methyl ethyl ketone		11	10
Methyl isobutyl ketone		29	10
Nitrobenzene	<	10	10
Pyridine	<	20	20
Tetrachloroethylene	<	5	5
Toluene	<	5*	5
1,1,1-Trichloroethane		6	5
1,1,2-Trichloro-1,2,2-Trifluoroethane	<	10	10
Trichloroethylene	<	5	5
Trichlorofluoromethane	<	10	10
Xylene	<	5	5

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline

Environmental/Analytical Testing Division

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification: CCWE Analysis-TCLP
U.S. EPA Method 624, 625
Sample Taken By: ATEC (KR)
Sample Matrix: Water
Date Sampled: September 21, 1989
Date Received: September 25, 1989
Date Analyzed: October 3 and 4, 1989
Analyst: DAL, BLK
Verified By: KSK
ATEC Lab Number: 891756

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)	P-2	Quantitation Limit
Acetone	< 10*	10
n-Butyl Alcohol	< 10	10
Carbon Disulfide	< 5	5
Carbon Tetrachloride	< 5	5
Chlorobenzene	< 5	5
Cresol	< 50	50
Cresylic Acid	< 50	50
Cyclohexanone	< 50	50
1,2-Dichlorobenzene	< 50	50
Ethyl acetate	< 100	100
Ethylbenzene	< 5	5
Ethyl ether	<1,000	1,000
Isobutanol	< 100	100

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification: CCWE Analysis-TCLP
U.S. EPA Method 624, 625
Sample Taken By: ATEC (KR)
Sample Matrix: Water
Date Sampled: September 21, 1989
Date Received: September 25, 1989
Date Analyzed: October 3 and 4, 1989
Analyst: DAL, BLK
Verified By: KSK
ATEC Lab Number: 891756

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)		P-2	Quantitation Limit
Methanol	<	500	500
Methylene Chloride		18	5
Methyl ethyl ketone	<	10*	10
Methyl isobutyl ketone		26	10
Nitrobenzene	<	10	10
Pyridine	<	20	20
Tetrachloroethylene	<	5	5
Toluene		12	5
1,1,1-Trichloroethane		58	5
1,1,2-Trichloro-1,2,2-Trifluoroethane	<	10	10
Trichloroethylene	<	5	5
Trichlorofluoromethane	<	10	10
Xylene	<	5	5

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline

Environmental/Analytical Testing Division

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification: CCWE Analysis-TCLP
U.S. EPA Method 624, 625
Sample Taken By: ATEC (KR)
Sample Matrix: Water
Date Sampled: September 21, 1989
Date Received: September 25, 1989
Date Analyzed: October 3 and 4, 1989
Analyst: DAL, BLK
Verified By: KSK
ATEC Lab Number: 891756

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)	P-3	Quantitation Limit
Acetone	32	10
n-Butyl Alcohol	< 10	10
Carbon Disulfide	< 5	5
Carbon Tetrachloride	< 5	5
Chlorobenzene	< 5	5
Cresol	< 50	50
Cresylic Acid	< 50	50
Cyclohexanone	< 50	50
1,2-Dichlorobenzene	< 50	50
Ethyl acetate	< 100	100
Ethylbenzene	< 5*	5
Ethyl ether	<1,000	1,000
Isobutanol	< 100	100

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification: CCWE Analysis-TCLP
U.S. EPA Method 624, 625
Sample Taken By: ATEC (KR)
Sample Matrix: Water
Date Sampled: September 21, 1989
Date Received: September 25, 1989
Date Analyzed: October 3 and 4, 1989
Analyst: DAL, BLK
Verified By: KSK
ATEC Lab Number: 891756

Page 2 of 2

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)	P-3 ~~P-2~~	Quantitation Limit
Methanol	< 500	500
Methylene Chloride	14	5
Methyl ethyl ketone	< 10*	10
Methyl isobutyl ketone	25	10
Nitrobenzene	< 10	10
Pyridine	< 20	20
Tetrachloroethylene	< 5*	5
Toluene	< 5*	5
1,1,1-Trichloroethane	8	5
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 10	10
Trichloroethylene	7	5
Trichlorofluoromethane	< 10	10
Xylene	< 5	5

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline

Environmental/Analytical Testing Division

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification: CCWE Analysis-TCLP
U.S. EPA Method 624, 625
Sample Taken By: ATEC (KR)
Sample Matrix: Water
Date Sampled: September 21, 1989
Date Received: September 25, 1989
Date Analyzed: October 3 and 4, 1989
Analyst: DAL, BLK
Verified By: KSK
ATEC Lab Number: 891756

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)	TCLP Method Blank	Quantitation Limit
Acetone	31	10
n-Butyl Alcohol	< 10	10
Carbon Disulfide	< 5	5
Carbon Tetrachloride	< 5	5
Chlorobenzene	< 5	5
Cresol	< 50	50
Cresylic Acid	< 50	50
Cyclohexanone	< 50	50
1,2-Dichlorobenzene	< 50	50
Ethyl acetate	< 100	100
Ethylbenzene	< 5	5
Ethyl ether	<1,000	1,000
Isobutanol	< 100	100

REPORT OF TEST RESULTS

ATEC Project Number 21-97312

Date: October 30, 1989

Client: CMW, Inc.
P.O. Box 2266
Indianapolis, IN 46801

Sample Identification: CCWE Analysis-TCLP
U.S. EPA Method 624, 625
Sample Taken By: ATEC (KR)
Sample Matrix: Water
Date Sampled: September 21, 1989
Date Received: September 25, 1989
Date Analyzed: October 3 and 4, 1989
Analyst: DAL, BLK
Verified By: KSK
ATEC Lab Number: 891756

*Compound detected below Quantitation Limit

Table CCWE Parameter (units in ug/L unless noted)		TCLP Method Blank	Quantitation Limit
Methanol	<	500	500
Methylene Chloride		28	5
Methyl ethyl ketone	<	10*	10
Methyl isobutyl ketone		28	10
Nitrobenzene	<	10	10
Pyridine	<	20	20
Tetrachloroethylene	<	5	5
Toluene		15	5
1,1,1-Trichloroethane		28	5
1,1,2-Trichloro-1,2,2-Trifluoroethane	<	10	10
Trichloroethylene	<	5	5
Trichlorofluoromethane	<	10	10
Xylene	<	5	5

Respectfully submitted,
ATEC Associates, Inc.

Keith S Kline

Environmental/Analytical Testing Division

CHAIN OF CUSTODY RECORD

PROJ. NO.: 21-97312

PROJECT NAME: CMW, INC RCRA CLOSURE

CLIENT: CMW, INC

LAB PROJ. NO.: 891756

SAMPLERS: (Signature) Kathryn Rypola

SAMPLING METHOD: HA

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY	TCLP-CCWE		SAMPLE LOCATION / REMARKS
S2-A	9/21/89	1:00	✓	✓		✓				✓		2	-1	✓									(0-6)
S2-B		1:15	✓	✓		✓				✓		2	-2	✓									(6-12)
S3-A		1:30	✓	✓		✓				✓		2	-3	✓									(0-6)
S3-B		1:45	✓	✓		✓				✓		2	-4	✓									(6-12)
S4-A		2:00	✓	✓		✓				✓		2	-5	✓									(0-6)
S4-B		2:15	✓	✓		✓				✓		2	-6	✓									(6-12)
S5-A		2:30	✓	✓		✓				✓		2	-7	✓									(0-6)
S5-B		2:45	✓	✓		✓				✓		2	-8	✓									(6-12)
S6-A		3:00	✓	✓		✓				✓		2	-9	✓									(0-6)
S6-B		3:30	✓	✓		✓				✓		2	-10	✓									(6-12)
P-1		3:45	✓			✓				✓		2	-11								✓		
P-2		4:00	✓			✓				✓		2	-12								✓		
P-3		4:15	✓			✓				✓		2	-13								✓		
TRIP BLANK		11:00			✓					✓		2	-14	✓									
S2-A DUP													-15	✓									
S4-B DUP													-16	✓									

ADD ON
PER MARK JAMES
DB

Relinquished by: (Signature)	Date / Time		Received by: (Signature)	Relinquished by: (Signature)	Date / Time		Received by: (Signature)
Kathryn Rypola	9/21/89	6:00pm	Mark L. James				

Relinquished by: (Signature)	Date / Time		Received for Laboratory by: (Signature)	Date / Time		Project Manager / Phone #:
			Dean Berger	9-25-89	8:50am	

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278